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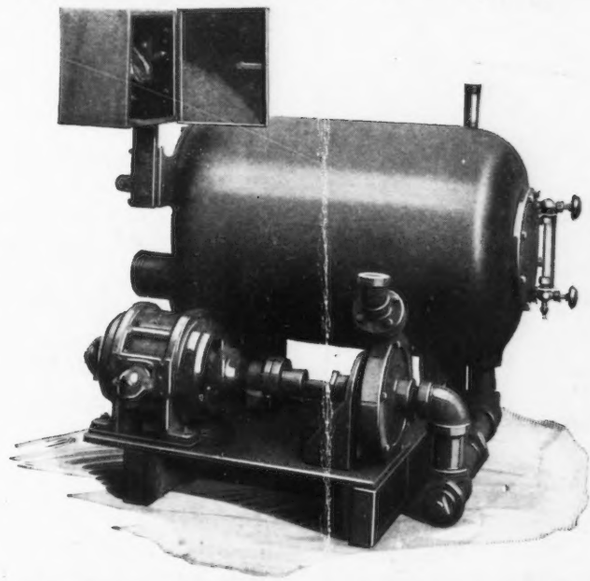

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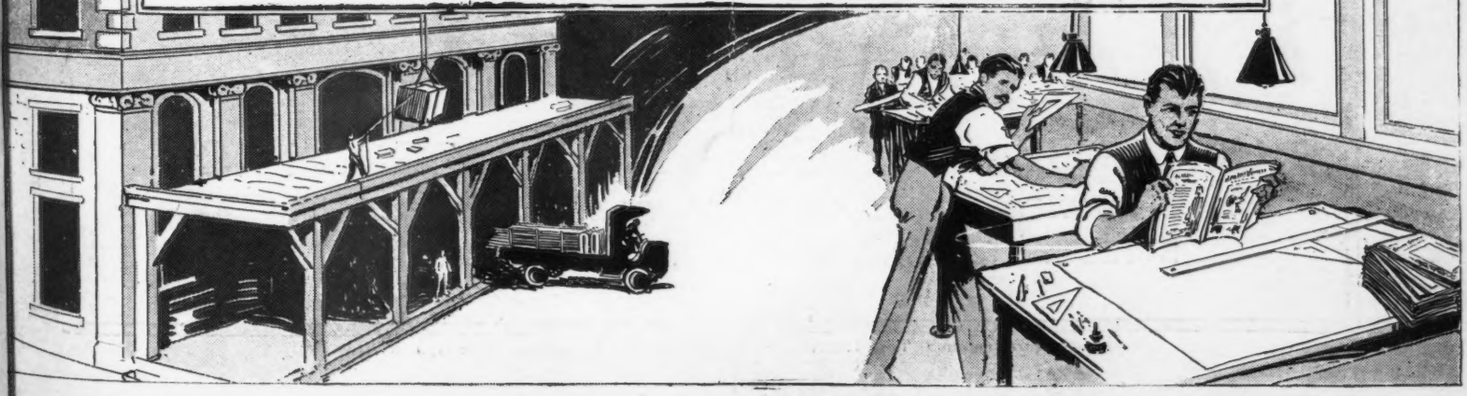

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FEBRUARY, 1920

OZONE AS THE SOLUTION OF THE "FRESH AIR" PROBLEM.*

Experiences in St. Louis School Buildings Which Have Resulted in Radical Changes in Design of Heating and Ventilating Apparatus.

By E. S. HALLETT.

MORE than two years ago the writer while making a study of the heating and ventilation of the St. Louis schools, was struck with the enormous waste of heat that passed up the vent stacks of all modern buildings. Seven or eight changes of air per hour were being delivered, all of which was discharged from the building after passing once across the school rooms. In the face of all this cost, many teachers complained more or less regularly of the heating system. It was apparent that the most nearly perfect system was not satisfactory to either occupant or operator.

It seemed to the writer preposterous that a scientific people as we are, acknowledging no defeat, and fresh from the conquests of science and art, should stand powerless before the task of rendering the air which we breathe a harmless and life-giving element. This struck the writer as a tremendous challenge worthy of the devotion of a life effort if necessary to the accomplishment.

What is that element or condition of the salt air or mountain valley that is so healing to the invalid and so delightful to all? It is not dryness, it is not lightness due to high altitudes, nor variation in amounts of oxygen or carbon dioxide. It is simply the presence of ozone, or atomic oxygen.

Ozone is not present in the air of cities because it is quickly consumed by the decaying matter and other oxidizable substances. It must now remain an indisputable fact that human beings require ozone as a normal constituent of the air, and the artificial supply of ozone is nothing but supplying the missing element which has disappeared, due to the results of dense population. Ozone is nothing more than oxygen in an intensely active condition. One great authority likens it to incandescent oxygen. It is made from oxygen by the silent brush electric discharge at a high-voltage of alternating current.

Ozone is a highly active form of oxygen. Its function; whether in revitalizing the air of a school, or in purifying the water of swimming pools, or in the several medical uses, is that of oxidation. Oxidation may be mild and healing, or it may be terrific conflagration. Ozone on account of its highly active chemical affinity must be handled with a full realization of its nature. In this respect it is only like many other of the beneficent resources of nature. On account of the great difficulty of making quantitative analysis of ozone in the low concentrations required in ventilation, there has until now been no guidance for its practical use. It is too low to be rated in percentages. The determinations in nature on the so-called ozone days in those places where it is found, is roughly about one part in a million of air. In such places there is no ozone odor. It just feels fresh.

Ozone has until recently been produced only by the electric spark of static machines, but when produced by the spark or arc, nitrous oxide and perhaps other nitrogen compounds are produced, which are objectionable in ventilation. The improved apparatus now produces ozone without noise or any moving parts, and at a cost so small as to be negligible. The current required for the ventilation of a 24-room school is about 700 watts.

* From a paper on "An Advance in Air Conditioning in School Buildings" presented at the annual meeting of the American Society of Heating and Ventilating Engineers, in New York, January 27-29, 1920.

Ozone is the long sought germ destroyer and leaves no injurious residue. We have sought a means of sterilizing the water of the air washer to prevent the spread of disease. We have sought a means of renovating air ducts to remove age-long smells in old buildings. Ozone accomplishes these results perfectly.

It is noticed that the tendency in recent times is toward the scattering of the heating plant, resulting in added expense and inconvenience, all to avoid the use of horizontal ducts in the system. It has even been proposed to construct the air conduits required for a heating system so that they may be thoroughly washed out. The use of ozone is equivalent to burning them out—rendering them perfectly odorless and sanitary. The Government Public Health Service has issued a bulletin in which it is shown that ozone is the best and most practicable means of sterilizing drinking water. It is a complete germicide and leaves no taste or other objectionable result. Some European cities purify as much as 24,000,000 gal. of water per day in this manner. These, with many other authentic practical installations, establish the fact that ozone is the long-sought harmless sterilizer.

LITTLE LITERATURE ON PRACTICAL USE OF OZONE.

Upon making a search of the literature on the practical working of ozone in school rooms, it was found to be wanting in this country. Quite extensive use has been made, in ventilation other than schools, in Germany, France and in the subways of London, and all with the highest satisfaction. It was necessary then for the writer to carry out tests that would have value and under such medical supervision as would inspire confidence.

Search was made for ozone apparatus which would produce pure ozone and under such control as would determine proper concentration.

FIRST EXPERIMENT.

It happened just at this juncture that our Doctor Stewart, the head of the hygiene department of the Board of Education, came to the building department with a complaint from one of our down-town schools that the air was so bad in some rooms that certain teachers threatened to resign on the advice of their physicians. The writer proposed to the hygiene department that the ozone experiment be started in this school.

The apparatus was set up in the air passage between the air washer and fan, and regulated to produce just sufficient ozone to be barely detected by the odor on entering the building, but not enough to make one conscious of an odor. The result was the immediate disappearance of all the stuffy condition and bad smells complained of. The remarkable thing was that every teacher and the principal pronounced the ventilation perfect. They stated that the conduct of the children as to lessons and behavior was noticeably better. No drowsy afternoons followed. Teachers stated that they were as fresh at the close of the day as in the morning. Colds and coughs nearly disappeared. No contagious disease developed during the six weeks trial, although the influenza was epidemic at this time. On several occasions a check was made on attendance and not an absentee was reported on account of sickness.

The building was not constructed to permit perfect re-circulation of the air, but the fresh air intake was closed down to 2 in. and the door to the basement was opened and the air drawn through (the economy even thus gained was about 25% in coal). During this period of influenza epidemic of February and March, the attendance in this school was more than 3% higher than the general average for this school.

EXPERIMENT CONTINUED IN COLORED SCHOOL.

The experiment was then transferred to a colored school having a plenum system with the Zellweger air-washing fan and with complete recirculation of the air. The ozone machine was set up just back of the fan, the ozone acting upon the water of the air washer as well. In this test the pupils and teachers were weighed weekly and a close inspection made by the staff physician of the hygiene department. The data from the weighing were interesting and instructive. About 75% of the children gained in weight on an average of about 1 lb. each. About 20% made no change and about 5% lost weight. Several very fat girls weighing about 175 lbs. each lost weight from 5 to 8 lbs. No indication of any illness or discomfort was noted. The principal was an old man, perhaps 70 years of age, and weighed 218 lbs. and quite inactive, and after about a week complained of dizziness and of feeling badly although on duty regularly. He lost 15 lbs. in weight. The physician made daily examinations and was at a loss to explain his condition. He was not sure whether it was due to ozone or merely the children it was decided that the ozone had caused a rapid oxidation of this superfluous tissue and it had been poured into the lymphatic system faster than the kidneys could remove it and the result was the illness stated. It is interesting to note that this principal has been in better health since that time and is anxious to have the ozone installed permanently. It is simpler than exercising for reducing weight.

No contagious disease occurred in this school. Both parents of one family died of influenza during this period and neither of two children in school contracted the disease. Colds were noticeably less. This colored school was perfectly free from odors. The coal consumption was measured and in comparison with days of equal outside temperature, the coal used was almost exactly one half. Agar plates were exposed in a room filled with pupils and the average count of bacteria was 225 which was extremely low, indicating that the ozone had destroyed the active germs of the air.

TEST IN SCHOOL WITH COMPLETE AIR RECIRCULATION.

Further test was made of another school having

complete recirculation without the air washer. In this school no teacher or pupil was aware of the experiment and after ten days the principal sent a note to the teachers to report whether they had observed any change in air of the building, whether worse, or better, or no change. Three had observed no change; all the others reported that they had noticed improvement; some were enthusiastic. One had first observed a marked improvement in the work of the pupils and was unable to account for it. One said it was delightful. No complaint of poor ventoilet room odors. When used in proper concentration for ventilation it has no odor itself. It reduces weight in persons corpulent from inacitvity. It appears from limited data to be a preventative of influenza. It undoubtedly is of great value in the treatment of influenza and pneumonia as demonstrated in the influenza hospital in St. Louis last year. To this should be added the evidence adduced by the medical authorities of France that ozone increases greatly the oxyhaemoglobin of the blood, thereby increasing the oxygen carrying capacity of it. This in turn cures

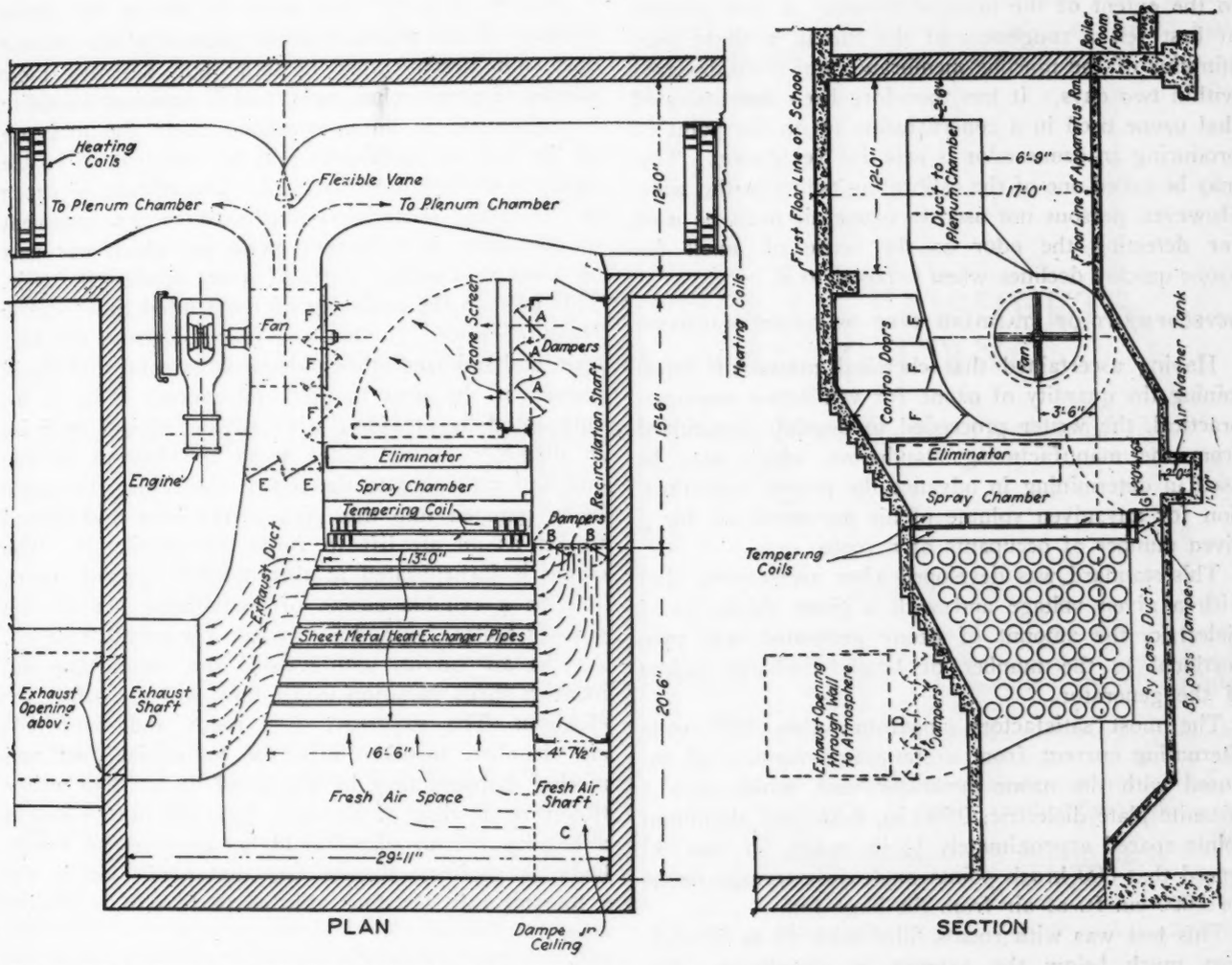


FIG. 1—NEW DESIGN OF HEATING SYSTEMS FOR ST. LOUIS SCHOOL BUILDING, SHOWING USE OF OZONE APPARATUS.

tilation had come to this office during this period. The principal volunteered the statement that he was sure it was a great improvement. The economy in coal was a little less than 50%.

RESULTS OF YEAR'S TESTS.

To sum up the results of a year's tests with ozone in the schools, the following facts are indicated. Ozone does destroy all odors resulting from the respiration, bodies and clothing of the children. It produces a mild exhilaration resembling that of a sea breeze or the air on a morning after a thunderstorm. It removes smells from the building due to lodgment of dust in ducts and the like. It destroys aenemic persons. The introduction of ozone in ventilation would probably remove the necessity for open air schools now common in most cities.

OZONE CAN SAFELY BE USED UP TO POINT OF PRODUCING ODOR.

Having carried out these experiments to the satisfaction and enthusiastic approval of all concerned and having discovered what seemed to have heretofore prevented the introduction of ozone in ventilation, it is deemed proper here to give some concrete details governing the installation in school buildings. In the St. Louis experiments it was early determined that in ventilation with ozone the maximum concen-

tration should be too low to give an ozone odor.

Tests were made to determine the effect on teachers and pupils when used up to that maximum—no illness or discomfort was detected in normal persons. On the contrary a mild exhilaration was experienced in every way similar to that of the refreshing sensation after a thunder storm. As previously noted, the very corpulent persons lost weight and in the case of an old man leading a very inactive life, ozone caused dizziness and headache for several days. The net results of this experience were of great benefit to all the persons. It reduced the weight to the extent of the inactive tissues. A few persons at first felt a roughness of the throat, a slight over stimulus of the mucous membrane, which disappeared within two days. It has therefore been demonstrated that ozone used in a concentration up to the point of producing an ozone odor is safe for ventilation. This may be called one of the calibrating points in the scale. However, persons not used to ozone air must be used for detecting the odor as the sense of smell for ozone quickly declines when exposed to it.

DEVELOPMENT OF STANDARD TYPE OF OZONE MACHINE.

Having ascertained that chemical means of determining the quantity of ozone for ventilation were impractical, the writer proceeded to develop a standard from the manufacturing standpoint, which may be used in determining in advance the proper concentration for any given volume of air movement or for a given number of occupants of a room.

This standard was developed after ascertaining that with a given voltage and with a given thickness of dielectric, the amount of ozone generated was proportional to the number of brush discharge points of the generator.

The most satisfactory apparatus uses 4000 volts alternating current from a static transformer, all inclosed with the ozone generator unit, which uses a micanite plate dielectric, 0.040 in. thick and aluminum points spaced approximately ½ in. apart. It was observed that 600 brush points made just enough ozone for 1000 cu. ft. of air from the blast fan.

This test was with rooms filled with 45 to 50 children much below the average in cleanliness. For rooms occupied by fewer persons, the brush points or voltage should be reduced. If conditions are to remain constant, some points should be disconnected but with varying conditions a controller should be installed to regulate the voltage by taking taps out of the primary of the transformers.

Where the air is recirculated in whole or in part, the ozone must be cut down to the point where no ozone odor is noticeable. In fact the revitalizing of the air of the average school room when recirculating 90% of the air will be effectively done with half the maximum stated above. The writer believes that the delay in the use of ozone in ventilation has been due to trials made with too high concentration and to the absence of any information on a means of control.

It is also true that until recently ozone was produced by static discharges through the air, the open arc or spark producing nitrogen compounds which were objectionable for ventilation. Ozone should be used with the blast fan to get uniform distribution, and the ozone machine should not be started until the fan starts.

Where it is desired to use ozone to take the place of ventilation in rooms with direct radiation, a small apparatus with a fan self contained should be used to distribute the ozone. It is fortunate that ozone is heavier than air and tends to get to the lower stratum of air which is the impure stratum. Ozone does not destroy dry bacteria but destroys most species of germs when moist and if sufficient humidity is maintained in an unventilated room the moisture of the mucous membrane will be sufficient to enable ozone to destroy most bacteria. The efficacy of ozone in destroying bacteria is illustrated in the treatment of the water in swimming pools by which one part of ozone to a million parts of water renders it sterile. This is upon the authority of the United State Public Health Service. In this case ozone destroys the bacteria and oxidizes other objectionable solid and liquid matter of the pool to inert substances. This is incorporated by providing a circulating pipe 4 or 5 in. in diameter taking water from the bottom at one end and returning to the top at the other, the ozone being pumped into this pipe at the base and caused to act as an air lift to force the circulation. The ozone is incorporated in this oblique upward travel.

With a reliable means of revitalizing the air the sizes of boiler, fan and air washer are greatly reduced. As the air carries within itself the revitalizing element, a small variation in air flow will not affect the children. The expensive hot room and tempered-air chamber, together with the individual duct and mixing dampers may be dispensed with. The writer therefore in view of all these facts set out to design a heating system that should be accepted by everybody as perfect. Recognizing that perfection is not a human trait he offers this as perfect in a relative sense.

HEATING SYSTEM DESIGNED IN LIGHT OF TESTS.

Fig. 1 shows a plan and sectional view of apparatus room of the last building designed by the St. Louis Board of Education. It will be noted that the plant is concentrated into compact quarters. The vented air goes to the attic without galvanized-iron ducts, only the heated air being carried in iron ducts. The vented air passes up the concrete shaft about the heat ducts. To avoid heat losses in the attic, an insulated trunk duct picks up the air from the shafts at the end of wardrobes. This vented air is delivered through the ceiling into the apparatus room as shown. This air may pass through control dampers and the ozone apparatus directly into the fan with 10% or any other amount of new washed and humidified air,

the proportion being at will or dependent upon the house leakage.

The foregoing sketches the apparatus for winter service. We require close regulation and a drop of 3° or 4° in temperature is the occasion for dismissal of the room. Custom has led us to tolerate but 2° or 3° of cold below 70°, but we tolerate more than 20° of heat. The loss of money and efficiency on this account is enormous. During September of this year the schools of St. Louis closed part or all of five or six days. Counting the cost of the schools for these days it was easily a loss of $100,000.00 to say nothing of low efficiency due to heat.

Since all things are reckoned anew it occurred to the writer that the temperature control should operate throughout the whole year, and, since the air can be recirculated, the humidity can be kept down and the comfortable temperature easily maintained.

The air washer is of no value as a cooling device for schools, because the humidity thus raised produces more discomfort than the heat. So in designing the new building exchanger pipes are installed to take all the returned air. The outside of these pipes is cooled by either the new air from the washer or by a direct spray of water from the washer system. These pipes are an integral part of the system and take the place of the tempering Vento coils for the tempered air room, so that the plant is really an all-the-year-around conditioning apparatus, that shall make it a delight and a refuge from all extremes of the climate.

PLAN AND SPECIFICATION DATA SHEETS FOR HEATING AND VENTILATING

Forms Suitable for Use in Preliminary Work Prior to the Design of the Installation Itself.

II.

IN the preceding installment of the article, published last month, the times covered, in a general way, the various points to be considered before laying out a system. This month's installment goes into details, the reference numbers corresponding to those used in the general preliminary data.

As explained in the previous installment, the complete form enables the designer to take up with the architect at one time all questions, without the omission of a single item, such matters as must be taken care of in his own design. All other information is supplied by the proper person of responsibility and the sheets are then placed on file where they are available both to the designer and specification writer, being indicative to each of what must be embodied in his own work.

(*Every item not marked "x" must be shown on plans.*)

CHIMNEY (Two)

"x" See lines 28, 29, 30 and 47 on preliminary sheets.
"x" Figure diameter on basis of burning———— lbs. coal per H. P. hour.
"x" Height suitable for————coal, or about———— ft, if possible.
"x" Name of nearest R. R. station———— on the———— R. R.
"x" Distance from R. R. station————miles.
"x" Condition of road for hauling ————
"x" Who builds chimney foundations? ————
"x" Character of ground for foundations ————

BRICK CHIMNEY.

Height above ———— ————ft.————in.
Inside diameter at top,———— "————"
Outside diameter at bottom above foundations ————ft.————in.
Extreme width of foundations————ft.————in.
Depth of foundations————ft.————in.
Water for construction available within ————ft.
Show thickness of walls and other details on drawings.
Locate smoke opening and clean-out doors.
Show dimensions of W. I. beams.
Show cap over chimney.
Is top to be plain or ornamental? ————

STEEL CHIMNEY.

Is it to be in masonry shaft or outside of building ————
If outside, is it to be self supporting or guyed? ————
To be erected by this contractor or be delivered to ————
Diameter ————in. Height————ft.————in.
Lower ————of stack to be ———— in steel.
Middle ————of stack to be ———— in steel.
Upper ————of stack to be ———— in steel.
Show cap extending over shaft surrounding chimney where required.

DRAFT APPARATUS. (Three.)

"x" See lines 28, 29 and 47 on preliminary sheets.
"x" Is cheap fuel available? ————

"x" What kinds ——Cost $——per ton (2240 lbs.
Are forced or induced draft fans to be used?——
How to be driven? ——
Single unit or in duplicate? ——
Will short stack be used? ——

Dimensions and Details.

———

ECONOMIZER. (Four.)

Square feet of surface ——
In —— sections of ——rows of tubes each.
Brick work to be provided by ——
Motor or engine for driving scrapers ——
Divided into two parts of—— sections each.

BOILERS. (Five.)

HORIZONTAL TUBULAR.

"x" See lines 37, 41, 42, 43 and 44 on preliminary sheets.
Will smoke consumers be used? ——
Number of boilers required ——
Style of fronts ——
Inside diameter of end rings of shell ——in.
Length of shell ——ft. ——in.
Thickness of shell ——in.
Thickness of head ——in.
"x" Thickness of butt straps ——in.
"x" Diameter of all rivets ——in.
"x" Pitch of girth seam rivets ——in.
"x" Short pitch of butt strap rivets ——in.
"x" Middle pitch of butt strap rivets ——in.
"x" Long pitch of butt strap rivets ——in.
Number of ——in. tubes ——ft.—— in. ——
"x" Heating surface ——ft. ——sq. ft.
Width of grate ——ft. ——in.
Length of grate ——ft. ——in.

Joints.

"x" Number of additional rows of rivets ——

Crowfoot Bracing.

(For boilers 54 in. diameter or less without manhole under tubes.)
There shall be ——weldless braces above the tubes.
——inches in diameter.

Through Bracing.

(For boilers 60 in. and above with manhole under tubes.)
There shall be ——longitudinal through braces above tubes ——inches in diameter.
Below the tubes there shall be —— similar tie rods ——inches in diameter.

Dry Pipe.

Is dry pipe required? ——(Sizes given on std. specif.)

Tubes.

"x" Are tubes to be charcoal, iron or steel? ——

Manholes.

"x" How many and where located? ——

Handholes.

"x" How many and where located? ——

Nozzles.

Provide —— in. nozzles. (See std. specif. for size.)

Supports.

Boiler to be supported on ——work.
Boiler to have ——brackets on each side. (See std. specif.)
Wall plates to be —— in. x ——in. x 1 1/2 in. thick.

Smoke Opening.

Smoke opening and uptake ——in. x —— in. (See std. specif.)
Size of main smoke pipe ——in. x ——in.

Blow-off Connections.

Size blow-off pipe ——in. (See std. specif.)

Grates.

For diameter of grates see "Boilers" or "Trimmings."

Fronts.

Name to appear on fronts. ——

Dimensions.

Face front head to center front nozzle——ft. ——in.
Face rear head to center rear nozzle ——ft. ——in.
Face front head to center first bracket ——ft. ——in.
Face front head to center second bracket ——ft. ——in.
Face rear head to center first bracket ——ft. ——in.
Face rear head to center second bracket——ft. ——in.
Floor to top of grates ——in.
Grates to boiler ——in.
Diameter of nozzles (See above) ——in.
Flanges ——in. diameter drilled for —— ft. bolted on ——in. circle.

SECTIONAL BOILERS.

"x" See lines 41, 45, 46 and 47 on preliminary sheets.
How many boilers ——show——make.
Round or sectional ——
Steam or water ——
Grates —— in. x —— in. with—— sq. ft. area.
"x" Maker's number ——
"x" Makes to be specified ——
"x" Sizes safety valve ——in.
On large sizes deepen ash pit 6 in.

SUMMER HEATER.

"x" See lines 45, 46 and 47 on preliminary sheets.
Show ——make.
Accelerating surface to be supplied ——sq. ft.
"x" Heat ——gal. water per hour ——deg. to —— deg.
Round or sectional ——
"x" Grate ——in. x ——in. with—— sq. ft. area.
"x" Maker's number ——

"x" Maker's name ————————————
"x" Size safety valve ————————————in.
"x" Size smoke pipe ————————————in.

BOILER TRIMMINGS. (Six.)

Size safety valve (use large enough, but use nothing over 4 in.)
Size blow-off cock.
(No blow-off larger than 2 1/2 in. Use blow-off cock and valve.)
Size main blow-off pipe
Style of damper regulator————————pressure. (Locate on plan.)
Are grates to be flat, shaking or rocking?————
Grates ————in. long x ————in. wide, with ————sq. ft. area.
If flue blower is used provide a 1-in. pipe connection from drum for each pair of boilers. (Tubular.)

BOILER SETTINGS. (Seven.)

See lines 24, 25, 41 and 43 on preliminary sheets. Mark drawings accordingly.
Depth of footings for boiler settings ————in.
Brick or asbestos over top of boilers ————
Side walls ————in. and ————in. thick.
Dividing walls ————in. thick.
Fire brick carried back to ————————
Are smoke consumers to be used? ————

SMOKE CONNECTIONS. (Eight.)

"x" Design same for ————————sized plant.
Weight of steel ————————
Number of clean-out doors ————————
Show all dampers and clean-out doors. See that smoke pipe does not interfere with manhole, nozzles of drums, and that there is 12 in. over the smoke pipe.
For size of uptakes and main flue see "Smoke Opening."

BOILER PLANT EQUIPMENT. (Nine.)

Scales.

"x" See line 49 on P. S.
Locate on plan scale No. ————of————make.
Platform ———— in. x ————in.
Depth of scale pit ————————in.

Coal Car.

"x" See line on P. S.
"x" Is Barrow or coal car desired ————————

Gage Board.

Locate on plan. Size ————in. x ————in. ————in.
"x" Specify number, size and kind of gages.

Filters.

"x" See line 51 on preliminary sheets.
Water service; for ———— gal. daily (24 hours) capacity.
Locate on plan in ————————

Feed-water Filter.

Size ————————in H. P. ————————

Water Meter.

Size ————————in————————make.

Hot Water Tank.

"x" See line 52 on preliminary sheets.
Tank furnished by————————
Connected by ————————
Size ————in. diameter x ————in. long.
"x" Lines of 1 1/4-in. pipe ————————
Size steam connection ————————in.
Return ————in.
Size water connection ————————in.
Blow-off ————in.
Is there an auxiliary summer heater for same——
"x" Connect discharge of water relief valve to ————
Place relief valve on tank, gate valve on supply, and gate, check and air valves on return. Support tank from floor.

Thermostat.

"x" See line 53, on preliminary sheets.
Size of valve (same as steam connection) ————in.

Feed-water Heater.

Show ————————make
Horizontal or vertical ————————
"x" Sq. ft. of ————tubing————sq. ft.
Show location and supports ————kind
Size steam inlet, outlet, and by-pass ————in.
Drip connection ————————in.
Size water inlet ————in. and outlet ————in.

Pump and Receiver.

Show ————————make
Is receiver standard or special ————————
How many pumps are to be used ————————
Size ————in. x ————in. x ———— in.
Make blow-off connection from receiver to ————
Size suction ————————in.
Run vapor pipe to ————Size ————

Boiler Feeder.

Size number ————————make
Size connections ————————in.

Injector.

Size number ————in. ————make.
Size connections ————————in.

Blow-off Tank.

Size ———— in. diam. x ————in. deep.
Inlet ————in. outlet ————in.
Discharge to ————————
Show 2 1/2-in. or larger vapor pipe to roof ————in.

Sump Well.

Size ————in. diam. x ————in. deep in. thick
Inlet ————in. outlet ————in.
Show 2-in. or larger vapor pipe to ————
Is sewer low enough to drain boilers, blow-off tank, sump well, etc. ————————

Ejector. (Steam.)

See lines 55 and 56 on preliminary sheets.
Size No. ————————in.
Size of suction ————————in.
Size of discharge ————————in.
Size of steam connection ————————in.
"x" Discharge fitting fur. and put in by ————

Ejector. (Electric.)

See lines 55 and 56 on preliminary sheets.
Show ——— make.
Size No. ——— make.
"x" Capacity ——— gal. per minute.
"x" Electric current taken from ——— kind
Size of discharge ——— in.
Discharge to ———
"x" Who provides fitting for discharge connection ———

Drainer. (Water.)

Size No. ——— and ——— make.
Size water connection ——— in.
Size discharge connection ——— in.
"x" Who provides fittings for water and waste connection ———

Separators. (Steam.)

Show ——— make.
Size ——— in. horizontal or vertical ———
Up or down current (if vertical) ———
Size drip connection ——— in. through ——— in. trap.
to ———

Extractor. (Grease)

Show ——— make.
Size ——— in. horizontal or vertical ———
Up or down current (if vertical) ———
Size drip connection ——— in. through ———
to ———

Exhaust Head.

Size ——— in. ——— make.
Height above roof ———
1 1/4-in. drip to ———

The concluding installment which will appear in the March issue, takes up in detail general materials, radiation, radiator finish, piping, pipe covering, fans, heaters, sheet metal work, registers and grilles, air filters and air washers, conduit work, pits and manholes, foundations, trenches and vacuum sweeper work.

THE MAINTENANCE OF SUPPLY MAINS FOR CENTRAL HEATING SERVICE

By F. A. Tucker.

Heating Engineer, Dansville (Ill.) Street Railway and Light Company.

HEATING mains consist of three principal parts; the pipe conveying the heating medium, the fittings making suitable connections between pipes, and the insulation. The maintenance of heating mains, therefore, is more difficult than the maintenance of gas or water mains in that not only must the physical structure of the mains be preserved, to prevent leakage of the heating medium, but the insulating qualities of the insulating material must be preserved to prevent "leakage" of heat. Although the insulating qualities may be impaired, temporarily at least, without affecting the physical structure of the insulation or main, any physical defect sufficient to cause leakage of the heating medium will at once tend to destroy the insulating qualities.

The enemies of heating mains as they exist underground in most cities are principally two, moisture and electrolysis. The evil effects of moisture are well known to all heating engineers. It principally causes a deterioration of the insulating qualities of the insulation, thereby greatly increasing the heat loss in the line. Ultimately it leads to destruction of the insulation and corrosion of the pipe and fittings—in other words, complete destruction of the main.

The source of moisture in the first instance is the surrounding soil itself. Standard practice recognizes this fact and does everything possible to make the main water tight in the first place by suitable waterproof coatings, etc., and to drain the moisture away from the main by providing underneath it one or more lines of tile surrounded by crushed stone or gravel, the tile being connected to sewer or sump. The skillful heating engineer in laying out his mains makes a study of the nature of the soil to determine whether, like clay, it tends to retain moisture, or whether it is sandy and rids itself easily of moisture. He also makes a study of the surface drainage over the entire route of the mains. Other things being equal, for instance, he would choose a well-paved street to an unpaved one on which water may stand for days at a time.

The mains, being situated in the best drained soil possible and made as water-proof as possible, should normally be well protected from moisture. Abnormal conditions will occur, however. A too frequent source of trouble is the city storm, or sanitary sewers. These sewers may spring a leak directly on the heat main which will in the course of time find its way inside the water-proof covering. Or they may be leaking at some distance from the mains saturating the surrounding soil with moisture.

FLOODING OF BASEMENT THROUGH STEAM SERVICE CONNECTION.

As an instance of aggravated sewer conditions, a large main city sewer became stopped up. Connected to this sewer was the outlet of a steam trap draining the water of condensation from a steam main. As the sewer became full a hydrostatic pressure was built up at the point of the trap connection,

causing the contents of the sewer to leak into the trap manhole. Moreover the water of condensation from the steam main soon commenced to leak out of the trap air vent and connections into the manhole. In the course of time the water in the manhole rose and gradually filled the air-space between the steam pipe and its insulating casing. Strange as it may seem, the flooding of a basement a block away was the first indication of anything wrong, the flooding taking place through the steam service connection.

Another abnormal condition is leakage of the heating medium through some break in pipe or fittings. Whether the heating medium is steam or water the chief bad effect is due to moisture. It is to be noted that the effect of a steam or water leak is cumulative. The moisture due to the leak promotes corrosion of the pipe and fittings, thereby increasing the probability of another leak. Furthermore, the pipe guides may become entirely eaten away, producing strains on expansion fittings and flanges which may rapidly pro-

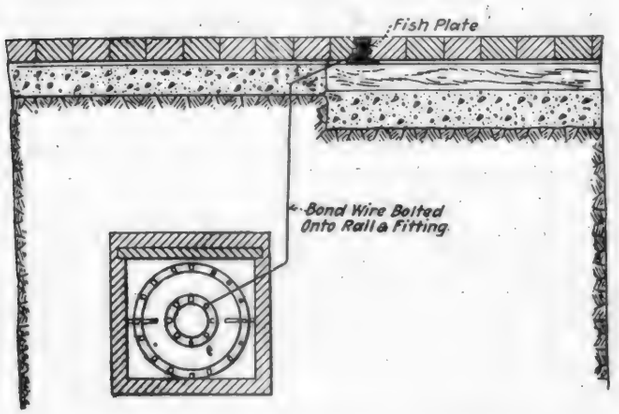


FIG. 1—BONDING OF STEAM MAIN TO ADJACENT RAIL.

duce other leakage. When a steam heating main is insulated with wood log casing, a steam leak in addition to the effects of moisture, will char or carbonize the wood, greatly weakening its mechanical strength.

Obviously it is impossible for the heating engineer to prevent these abnormal conditions. The mains are buried under ground, cannot be inspected and it is not possible to tell where or when a leak is going to take place. The next best thing and the first duty of the maintenance department, is to detect and correct the trouble without delay. The importance of immediate attention is not always appreciated, particularly where the maintenance department is not thoroughly organized. Nowhere is it more true than in this line of work that a stitch in time saves nine.

CONDITIONS THAT CAUSE ELECTROLYSIS.

When a heating main is located under city streets over which electric railways are operated the mains are very apt to be subject to the action of electrolysis. Electrolysis seems to attack all parts of the main with equal facility, causing the familiar pits which eventually become holes. Three facts about electrolysis are of main interest to the heating engineer. It occurs where the current leaves the pipe or fitting for the ground. Its effect depends on the magnitude of the current flowing. It is greatly aided by moisture in the ground which increases the electrolytic conductivity of the soil and hence the amount of current flowing. There are three remedies for electrolysis; first, better bonding of rails or insulation of rails from ground; second, application of protective coatings to pipe and fittings; third, bonding of pipe to rail or other part of return circuit. The first remedy is an indirect one as far as the heating engineer is concerned. He has to work through the electric railway. The second remedy, that of protective coatings, is of rather doubtful permanence, although recent installations have adopted it. The third remedy is the one which the heating engineer can apply himself.

Bearing in mind the phenomena of electrolysis described above, a reference to the sketches will make clear the application of the third remedy. Fig. 1 shows the bonding of a steam main to a rail adjacent to it. This may be efficacious if electrolysis has been discovered at the point of bonding, the theory being that since electrolysis occurs at the point the current leaves pipe for ground, the ground can be short-circuited or by-passed by a conductor of greater conductivity, namely a copper wire. Acting on this theory it might be thought advisable to bond the main to the rail at regular intervals, as shown in Fig. 2. This may work all right but it must not be forgotten that by thus placing the main in parallel with the rail electrically the amount of current carried by the main is greatly increased. If, therefore, a point between bonds occurs, as shown at "A" in the figure, where for some reason the conductivity of the ground exceeds that of the pipe, the current will shunt around through the ground, and, due to the increased current, the electrolysis effect at "A" will be magnified.

Fig. 3 shows a method of bonding which was applied to a new installation. It is to be noted that the bonding wire is attached to all intermediate fittings, the idea being to eliminate as far as possible the high resistance points in the main where the current would tend to shunt to ground. Much more could be writ-

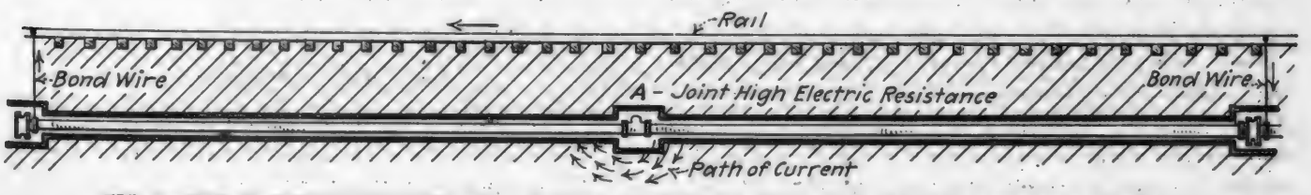


FIG. 2—HOW ELECTRIC CURRENT WILL SHUNT AROUND THROUGH THE GROUND BETWEEN BONDS

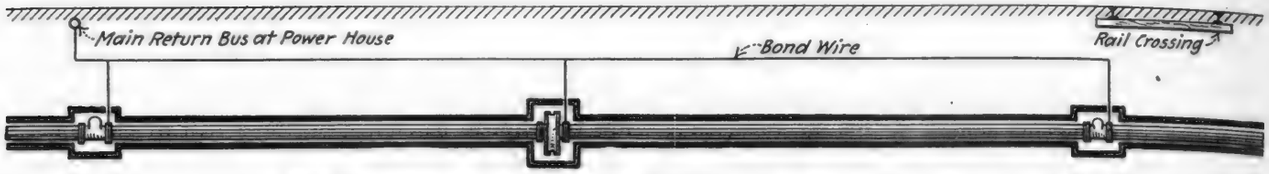


Fig.3—METHOD OF BONDING APPLIED TO A NEW INSTALLATION.

ten on this subject but it is believed enough has been said to indicate that bonding should not be resorted to indiscriminately but only after careful study of conditions.

It is evident that, given a reasonably correct original installation, the proper maintenance of heating mains depends on the rapidity and thoroughness with which abnormal conditions previously described are corrected. Detection of location of leaks is not always easy and calls for considerable experience. The remedying of the trouble is nearly always disagreeable work especially if it has to be done in winter. Furthermore, it must be borne in mind that it is not sufficient merely to correct the physical defects, but the insulating qualities must also be restored as far as possible. The ordinary pipe man or fitter seldom appreciates the attention to details necessary in repairing underground mains. For this reason experience has shown that all work of this character should be done by an organization especially trained for the purpose.

HEATING SYSTEM OF EAST CAMP, NAVAL OPERATING BASE, HAMPTON ROADS, VA.

Interesting features of the heating work for what is described as the largest vacuum heating system ever installed as a complete contract are contained in The Walworth Log for December, 1919, the periodical of the Walworth Mfg. Co., of Boston. The plant is that for the Naval Operating Base, situated on the old Jamestown Exposition grounds, at Hampton Roads, Va., destined to be the greatest naval base in the world. The cost of the heating system alone exceeded $1,000,000 and was let on competitive bids. In spite of labor shortage and difficulty of getting material to the job, the work was completed in eight months.

It was necessary to install a boiler capacity of 4,000 H. P.

There are two chimneys (one for each row of boilers), 150 ft. high, with an internal diameter at the top of 9 ft. Each row of boilers is connected to the stack with a steel breeching 8 ft. high and 10 ft. wide with a main damper in each, controlled by a special hydraulic damper regulator. Each boiler outlet is equipped with a non-return stop valve and is connected to a 12-in. header which encircles the boiler room with expansion bends. There are two boiler-feed pumps 14 x 10½ x 12-in. duplex interconnected, so either one may be used. Discharge from the pump to the boilers consists of a loop around the boiler room, so arranged and valved that various portions of the boiler feed line may be cut out without shutting down any of the boilers.

The feed-water heater is open type, capable of handling 153,000 lbs. of water per hour from a temperature of 110° to 210°. Returns from the heating system are connected to three vacuum pumps, interconnected so one pump is out of service while the other two are in operation. These pumps are 18 x 26 x 28-in. single-acting, and are among the largest vacuum pumps ever installed for heating systems.

From the boiler house the steam is carried at 100 lbs. pressure in a 10-in. loop, extending around the entire reservation. From this main steam loop, branch lines are taken through pressure-reducing valves to feed various groups of buildings. The heating system line carries 5 lbs. pressure and the line for the sterilizing, cooking and hot water generators, 35 lbs.

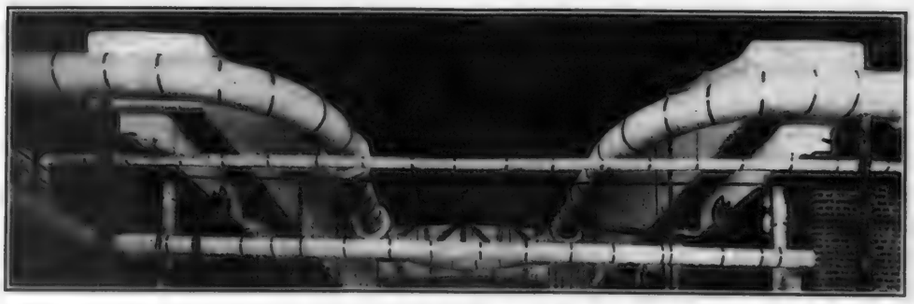
SUPPLY PIPING CARRIED OVERHEAD ON POLES

All supply piping was carried overhead on poles in order to facilitate the erection and to avoid the excessive cost of building waterproof trenches, as in some parts of the reservation water was encountered near the surface of the ground. This overhead main is insulated with 4-in. asbestos air-cell covering. Expansion was taken care of by 25 expansion U-bends on the main supply lines, spaced about 500 ft. apart. How well these expansion bends take care of the expansion, may be surmised from the fact that the steam has been turned off and on the entire system many times without causing a broken flange or a leak of any sort. All return mains are installed in wood-pipe covering.

Direct column radiation is used in all buildings except storehouses and drill halls where coils are used. Thermostatic vacuum traps are used on the returns from all radiators and at all drip points.

RESULTS OF TEST SYSTEM.

A few items of the test might be interesting. The drop in pressure from the power plant to the last point on the high pressure line is 16 lbs. At the time of the



SKETCH PHOTOGRAPHS OF THE HEATING SYSTEM AT EAST CAMP, NAVAL OPERATING BASE, HAMPTON ROADS, VA.

designing of the plant it was figured at 20 lbs. With 2 lbs pressure at the pressure-reducing valve and 4 in. of vacuum at the power plant, every radiator on the entire system circulated without the least noise of any sort. Considering that from the last radiator to the power house is approximately 2 miles, it shows how well the work was designed and installed. The temperature of the return water from the heating system averaged about 125°.

There are installed 113 miles of pipe, ranging from ¼-in. to 12-in. in diameter; 400,000 sq. ft. of radiation; 5,000 valves ranging from ⅜-in. to 12-in. in size; 6 miles of wood-pipe covering and trenching. The entire installation was designed in the Bureau of Yards and Docks by Admiral Parks, chief of the bureau, and under the mechanical project managers, Bates & Hill. A A. Klonower was in direct charge of the entire design.

The entire contract, including stacks, erection of boilers, concrete work, etc., was awarded to the M. A. Dame & Son Co., with main offices in Lynn, and Norfolk. C. T. Dame, president, was in entire charge of the work from start to finish, making Norfolk his headquarters during the progress of the work.

Mr. Klonower has subsequently become vice-president of the M. A. Dame & Son Co.

MAKING AN OLD HEATING SYSTEM EFFICIENT.

It is a matter of common experience that a project laid out and built in accordance with a sound fundamental plan answers its purpose more efficiently than one built in a piece-meal haphazard fashion. In one particular case the haphazard system applied to the design of the heating system of a hotel produced in the end very happy results.

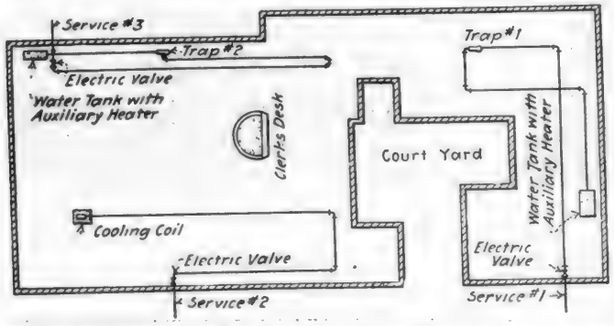


FIG. 1—GENERAL PLAN OF BUILDING SHOWING THREE STEAM SUPPLIES.

The sketch Fig. 1, shows a general plan of the building. It is supplied with steam from central heating mains by three different services. These services supply three entirely distinct heating systems, and both services and heating systems were added from time to time as the building spread over more ground. This hotel has been enjoying a flat rate for steam, but was finally transferred to a meter basis. Upon this transfer a survey was made to determine how the efficiency of the entire building could be increased. It was decided that to remodel the heating system would be out of the question, and therefore the points to be attacked were (1), how can the heat be best regulated as it is, and (2), how can the heat from the condensation as it leaves the steam trap be best utilized.

Although at first glance the three separate heating systems apparently led to much unnecessary piping in the basement and hence increased the unavoidable condensation loss, further analysis showed that from the standpoint of regulation the flexibility was greatly improved. For instance, it was found that by suitably distributing the guests over the house, one and sometimes two of the heating systems could be shut off at the service during the night and part of the day in moderate weather. To still further increase the flexibility and ease of regulation, it has been decided to install an electrically-operated service valve on each service, the operation of all valves to be controlled by switches from the clerk's desk in the lobby.

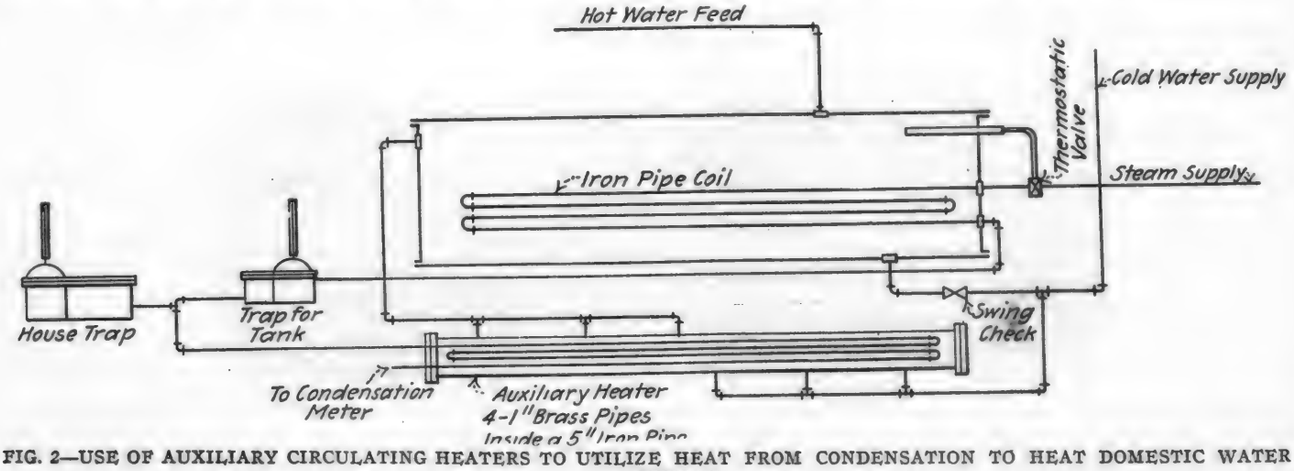


FIG. 2—USE OF AUXILIARY CIRCULATING HEATERS TO UTILIZE HEAT FROM CONDENSATION TO HEAT DOMESTIC WATER SUPPLY.

The utilization of heat from the condensation presented some difficulty. The ordinary "cooling coils" could not be used to advantage in two of the systems as they would supply heat to rooms already overheated, one of them a kitchen. Inasmuch as the building was not equipped with a circulating system for domestic hot water service, it possessed two water heating tanks located in opposite ends of the building, as shown in the sketch. It was found feasible to equip these water tanks with auxiliary circulating heaters, utilizing the heat from the condensation. As shown in Fig. 2, the cold water supply is led first through the auxiliary heater where its temperature is raised by the condensation some hundred degrees, and then to the main tanks where it is further heated by steam. The supply of steam is in each case controlled by a thermostat.

It was found possible to use the heat from the condensation in the third system in the regular cooling coils, to supply hot air to a lobby.

THE ARCHITECTS' MOVEMENT TO IMPROVE RELATIONS WITH THE ENGINEERS AND WITH THE PUBLIC.

Some of the Important Points Brought out in the Convention Discussions of the American Institute of Architects.

A realization on the part of the architectural profession that its relations with the engineering world and with the public are not all that they should be has resulted in a movement, inaugurated by the architects themselves, that is destined to bring about radical changes in many time-honored architectural practices. This movement is being directed by the Post-War Committee on Architectural Practice of the American Institute of Architects, and is the subject of a recently-issued report of progress, which contains many items of interest to the heating profession.

In discussing the report it should be borne in mind that the Post-War Committee was appointed because the board of directors of the institute believed this was an exppedient moment for the architectural profession to take account of its stock. The committee was intended to serve as a question box in which all of the many questions which have come up before the institute could be studied and definitely answered. The committee was instructed to go even farther and step outside of the institute and try, if possible, to get the ear, the criticisms, and the suggestions of the whole profession, as well as those of all professional men.

Most of the matter embodied in the report are the criticisms, comments and suggestions brought out at the convention of the institute held a few months ago in Detroit. President Thomas R. Kimball sounded the keynote by asking "Are we in right relation with those we serve, the public; with those, with whom we serve, all those who help us to build; and with those who parallel our service in our own and our brother professions?". President Kimball proposed what he termed a Brotherhood or League of Professions, with a permanent Ethical Court, whereby each profession, with the help of the brother professions, could really "clean house."

EXTENSION OF THE ARCHITECT'S SERVICE.

The first item taken up was that of the extension of the architect's service. One way in which he can do this, it was brought out, is in connection with industrial building. Such buildings, said one speaker, have problems exactly suited to the architect, and yet the profession, as a whole, seems not in sympathy with that kind of building. Architects have allowed engineers and builders to do the work which the architects it was claimed, can do far better. The architect is fitted, by training, to plan and arrange an industrial plant, because the architect, in his education, receives the training of the imagination which allows him to solve the problems of the manufacturer better than anyone else.

There is also the call from the workman for the betterment of his condition. In fact, it is now the great subject that concerns the world. The architect, it was argued, possesses the means and the ability by which he can do the work. It was therefore urged that architects take up industrial problems and not stand aloof on these important things.

Community planning was also mentioned as a field that should arouse wider interest on the part of architects. By community planning was meant the comprehensive town plan, in all of its phases, districting and zoning, and the larger aspect of community life, including the elimination of the glaring blunders that are made from day to day, without regard for the future and at a terrific cost to future generations.

Another speaker urged that the profession of architecture should broaden out and consider itself as made up not only of professional men, but also as business men who must inspire their clients with confidence in them as business men, irrespective of their training in art. Firms employing contracting engineers and constructing engineers to do their work do so because they have confidence in them as business men and because they give complete service. They do not say, "Well, we will handle your plans for so much, but you will have to employ a consulting engineer, and let the work to a contracting firm, etc., etc." They are employed because they furnish complete service for one fee. The architects, it was held, must do likewise.

As a practical step in the direction indicated, D. Knickerbacker Boyd, who is well known to the heating trade through his address at a recent convention of the master steam fitters' association, urged that each architect should first read and study the building laws of his city or of the State, if there are any laws of the State, as well as the housing and sanitary laws affecting his practice. Mr. Boyd also proposed that the architects should keep in touch with all civic associations and other civic bodies, all chambers of commerce, and should also affiliate with engineering bodies and builders' exchanges and should co-opperate in arranging for exhibits of building materials, and in doing everything which makes for a better understanding of the structural side of architecture. As an illustration of the way these matters were being neglected by the architects he cited the "Own-Your-Home" exhibit in Philadelphia where, he said, there was not one thing that would make the 100,000 people who visited the exhibition realize that an architect could or should have anything to do with the improvement of the houses of the people, either as to convenient planning, designing of attractive features, or providing sound principles of construction.

SUGGESTIONS FOR ENLARGING THE FIELD OF THE ARCHITECT.

Supplementing the idea for extending the architect's service, a special session was devoted to the matter of education, and among the suggestions was one that architectural students should be affiliated with accredited construction companies to make them familiar with estimating and superintendence. Another was for a course of instruction on the design of industrial plants with modern methods of unit multiplication, and factory construction. Still others urged a course in housing, with its social relationships, and a course in business promotion, showing sound methods of promoting and financing building operations.

STANDARDIZATION OF BUILDING PRODUCTS.

One of the important items that came in for discussion was the standardization of building products. This was described by Mr. Boyd as the acceptance by competent organizations, at appropriate intervals, of definite results in an orderly development with respect to materials and their efficient use or safe arrangement. As a first step in the direction of standardization, he proposed the elimination from specifications of many time-worn and familiar phrases used with indiscrimination and frequently without regard to the cost or character of the building or the stabilization of the market for materials and labor. He held, for instance, that the unfortunate practice of calling for all materials, notably the products of nature or those dependent upon heat for their hardening or transmutation, "to be of first quality only, free from imperfections, blemishes, defects, etc., etc." works on economic hardship all along the line. If only hard-burned bricks, for example, were to be used in building construction, approximately one-quarter of all the bricks produced would have to be thrown away. Regarding building appliances, he asked why should the roughing-in sizes for each plumbing fixture be entirely different from all others and why a vast array in types of tubs and all other fixtures. Why not fewer patterns in hardware, in radiators, and in boilers, which should have a standard basis of rating?

PROFESSIONAL PRACTICE OF ARCHITECTS.

At one of the sessions a lively discussion arose over several practices of architects, notably that of securing estimates for heating work from heating contractors, without paying for such estimates. Mr. Boyd related a talk he had with the president of the Eastern Pennsylvania Chapter of the American Society of Heating and Ventilating Engineers which is worth reproducing, in full.

"Just before I left Philadelphia," said Mr. Boyd, "I was talking with this gentleman and I told him I was coming down here to a convention of architects. He said, 'What are they going to do?' I said, 'The principal discussion is post-war activity; we are going to try to find out what, if anything, is the matter with the profession.' And he said, 'I will tell you one thing that is the matter with the profession of architecture. It does not live up to its own principles.' I said, 'Now, be specific. What do you mean?' He said, 'Well, there is a clause in your Professional Practice of Architects which states that architects are to be reimbursed for the cost of services of mechanical engineers, heating and ventilating engineers. How many architects are there in Philadelphia? About two hundred and fifty architects and about a hundred so-called. How many heating and ventilating engineers are there in Philadelphia? Just four. Now, what is the answer? The architects have the right to charge their clients for the services of heating engineers, and they do not do it. They employ, or rather they do not employ, they simply get the contractors for heating and ventilating throughout the city of Philadelphia to make their plans for them. In one of our architect's offices I know of, one particular firm of heating contractors maintains a man in that office to make that architect's drawings for heating and ventilating, and he is there almost all the year round.'"

The consensus of opinion expressed on this subject was that it was up to the architect to prepare the plans in his own office, or employ someone to do it.

It was brought out that in Cleveland the heating engineers have gotten together and have taken exception to the unfair proposition of having the architects get data from them on the basis of which the architects intend to figure the estimates for themselves. "Unless we specify the size of the radiation, the size of the boiler, and everything," it was stated, "they will not figure on the work. It is the righteous thing for them to do, and for us to have done at our own expense, under whatever fee we choose to charge."

At the conclusion of the discussion the meeting went on record as opposing the practice complained of by adopting the following resolution:

Resolved, That securing gratuitous expert service from contractors or material men in connection with the preparation of plans and specifications is contrary to the spirit of the Circular of Advice, is contrary to the best interests of the owner, belittles the profession in the eyes of the building world, and can not be too strongly condemned. Every individual architect should not only refrain from such practice, but take every opportunity to discourage the practice by others.

RELATIONSHIP BETWEEN ARCHITECTS AND BUILDERS.

One of best addresses at the meeting was made by W. G. Luce, who acted during the war as chief of construction of the Housing Division of the Shipping Board. He said, among other things:

"The principal item which was called to my attention by almost every individual with whom I conferred, as a stumbling block and a matter which prevented harmony and co-operation between the architect and contractor and which can be interpreted as either criticism, a suggestion, or a grievance, as you may see fit, was the question that we seem to always have with us, that certain things not shown or called for but which in the architect's opinion are necessary to produce a complete building must be furnished by the contractor; and I believe that this one item has more to do with the unsatisfactory conditions which exist in many quarters than any other single question.

"I am putting up to you the builder's side of this question, as I understand I am here for that purpose, and his reasons for feeling as he does. Although the feeling on this matter is not confined to builders only, as it has been brought up by those connected with the building industry in other ways, and especially by many of the architects themselves, and I wish to here quote from an article by an architect in one of the leading architectural magazines." He quoted from a specification as follows:

"Contractors will note carefully all parts of the drawings and specifications, and will call the architect's attention to errors or ambiguities before signing contract. Any work erected according to errors in the plans will be replaced at the contractor's expense. 'The contractor shall furnish all radiators of sizes shown in plans, and must further guarantee to heat the building in 20° below zero weather to 70° F.'

"This author then goes on to say that 'on specifications like the latter we have actually asked contractors to submit fair competitive bids.'

"From my talks with various contractors it develops that just such clauses and conditions as the above tend largely to force him to look for a means of protection which in many instances results in his making arrangements for producing the plans and specifications through some means under his control, he taking the stand that while he is perfectly willing to co-operate with the architect, report to him any mistakes or discrepancies which he may discover, he is not responsible for them. The architect is being paid by the owner to make plans which are workable, which are correct, and the architect in accepting the commission to make such plans necessarily must claim to have the requisite knowledge and ability to do so, and it is no more the province of the contractor to pay for mistakes or omissions occurring in plans or anything necessary to complete them than it is the architect's duty to pay for the rectification of any mistakes of the contractor or to make good any of his omissions.

"Of course, the contractor knows that in justification of this, the architect claims that the builder should know what is necessary to make a complete building. To this he agrees. But he also calls my attention, and I put it up to you for careful consideration, that if he does know what it takes to make a complete building and is competent to produce a complete building, why should he not have the game as well as the name, and produce the building without being penalized for anyone's omissions and errors but his own?

"In this particular phase of the question, gentlemen, I believe you will find a substantial portion of the answer to the question as to why so many projects are being executed without the services of an architect, practicing as such. And is it not the logical outcome of such a condition?"

RECOMMENDATIONS OF THE POST-WAR COMMITTEE.

Acting on the suggestions made at the convention the Post-War Committee has now gone on record as favoring:

Machinery for the establishment of definite permanent affiliations between all national organizations in the building industry.

A direct permanent relationship with all technical bodies with a view to the establishment of common principles governing the professional relations, and that such an inter-professional relation should ultimately be expanded to a permanent league of vocations, into which there should be admitted every vocation which recognizes its functional social obligation of service.

This is a specific recommendation for the consideration of the institute, and is an elaboration, on a national scale, of the guild idea.

The Post-War Committee further concludes that nothing has been more detrimental to the establishment in the public mind of a clear knowledge of the architect's function than the practice of architects in voluntarily offering to furnish plans and designs without compensation.

Drafts in Buildings and Window Leakage.

"A space of one-eighth of an inch or more will be found around almost every window and door frame in the average residence or flat building. This may seem little, but when it is realized that one-eighth of an inch around thirty windows equals an open space of 3 by 2 ft. can we be surprised at excessive coal bills and poorly heated rooms," says R. T. Bedster of the Bedster Calking Company.

"Window and door frames leaking air around the casings or into the walls behind the plaster is no fault of construction or the materials used—as all wood will warp and shrink—contract and expand; mortar will fall down and such a condition is usually harshly judged as poor or shoddy work.

"As the warping of the wood of the window frame and the settling of the stone, brick or concrete of a building occur, there is bound to be that variation between them which will allow the inleakage of cold air, dust, soot and water and the out-leakage of warm air. These changes are not definite and never cease. Temperature, moisture and indeterminate causes make for expansion, contraction and settling. Therefore, a positive joint of cement, mortar or other solid material is impractical; oakum or similar material must be tightly driven in and this causes the windows to stick in their frames. These variations must be taken up by an expansion joint; some material that will expand as the crevice widens and contract, too, as the crevice narrows at all times, forming an air and water-tight seal."

For this purpose Mr. Bedster recommends Calk-Tite Paste as manufactured by his company. It is generally considered, however, that the most effective measures for this purpose are metal weather strips which are now obtainable in a variety of forms.

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IF ANYTHING like the plans formulated by the architects for the advancement—we had almost said the rehabilitation—of the architectural profession are put through, it will constitute the most thorough-going movement that any of the professions has taken towards adjusting itself to the new world order. No one can read the statement of progress put out by the Post-War Committee on Architectural Practice of the American Institute of Architects without realizing that the architects are fully awake to the conditions they are facing and that they are very much in earnest in their determination to place the profession in line with what the committee characterizes as "quite a different world" from that which existed shortly before the Armistice was signed. Not only are the architects preparing to adjust many things which pertain strictly to themselves, but they are also seeking to improve their status with the building construction industry in general in a way that will have a very definite effect on all engaged in this industry.

For one thing, it is proposed that the architects adopt a more democratic form of organization to include not only draftsmen as well as architects, but with the aim of creating a guild, the membership of which would be limited only to those who earned their living in the practice of architecture. "Has not the time come," it is asked, "when we should cease splitting up and begin drawing together? And on what lines should people be so closely drawn together as along the line of their vocation—the thing by which they gain their livelihood? Not along the line of their special craft, but along the line of the whole industry of which they are a part, for their own welfare is indissolubly bound up in the welfare of the industry as a whole." Then the committee adds: "Carried to its logical conclusion, this would mean a guild of the building industry. * * * Architects do not represent the building industry and its faults are not alone their faults. Contractors do not represent it, either, nor do draftsmen or workers. It is an intangible and irresponsible body, at the present moment, because no one is responsible and there is no collective responsibility. It is easily conceivable that ultimately State societies (of architects) should not confine their membership to architects, or even to draftsmen, but that they should seek to create a tangible guild embracing all who have adopted building as a vocation."

As an initial step towards this end it is proposed "that the American Institute of Architects should set up machinery for the establishment of definite permanent affiliations between all national organizations in the building industry" together with "a direct permanent relationship with all technical bodies," to be expanded ultimately into "a permanent league of vocations."

Some of the discussions that led up to these conclusions are especially interesting to engineers and contractors in the kindred professions. One speaker came pretty near the crux of the situation when he stated that for generations the architectural profession has admitted a serious division of its field. In the mediaeval period not only the churches and other buildings, but the fortifications as well, were built by architects. The "engigneur" whose duty it was to mine and countermine and in part destroy what the architects did, later became a constructor, the "ingenieur" or engineer, who presently specialized in the constructive problems of buildings, among other things, and who now would like to do the entire building although lacking architectural discipline. If there had never been maintained a division of this field, he argued, the architects would not now be facing this problem. As it is, others are more and more trying to get building work and are organizing to do it.

Before the heart-searching had ended, the matter of percentage remuneration was brought out into the open and the prevalent practice of accepting plans and estimates from the heating contractor for that part of the mechanical equipment of buildings, came in for some vigorous discussion. It is a pleasure to note that the Institute has definitely gone on record with a resolution that "securing gratuitous expert service from contractors or material men in connection with the preparation of plans and specifications is contrary to the spirit of the Circular of Advice, is contrary to the best interests of the owner, belittles the profession in the eyes of the building world, and cannot be too strongly condemned. Every individual architect should not only refrain from such practice, but take every opportunity to discourage the practice by others."

To the man on the street it looks as if the architects have seen a great light. Yet the advances made are manifestly a sincere effort to establish firmer foundations for the entire building industry and as such they will have no doubt a marked effect in bridging the gap between the architect and engineer-contractor which has grown wider, rather than narrower, in recent years.

WRINKLES

Protection and Insulation of Underground Steam Mains.

A rise in a steam pipe will form a pocket for the collection of condensation. If this is located over-

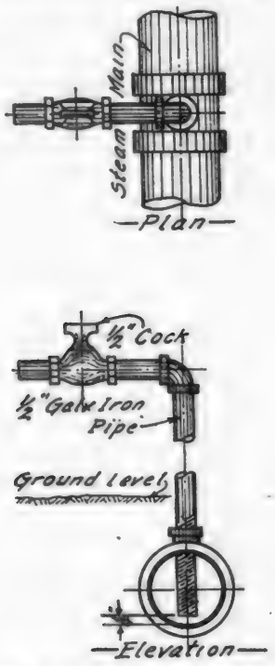


FIG. 1—METHOD OF KEEPING UNGERGROUND STEAM MAIN FREE FROM CONDENSATION.

head, it is an easy mater to drain it through a trap back to the feed-water heater. If the pipe is in the floor or underground a pit is required for access to the trap. Where the amount of moisture is small and the distance for return too great a moisture blow-off may be installed and used when required to keep the underground steam main free of condensation. As shown in Fig. 1 a 1/2-in. galvanized pipe is connected into the outlet of the reducing tee in the main and extended inside to 1/4 in. from the bottom. The cock is opened and allowed to blow until steam appears.

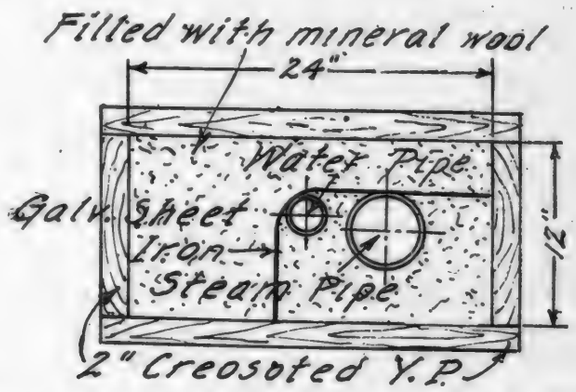


FIG. 2—PROTECTION FOR SMALL UNGERGROUND STEAM MAINS.

In running small steam mains underground for the heating of outlying buildings they may be insulated and protected by enclosing within a continous box of 2-in. creosoted yellow pine. As there is usually a small water pipe serving the building to be heated it is an advantage to run this in the same enclosure. This avoids extra excavation and maintains the water-line in operation during cold weather. As shown in Fig. 2, the rain water from above ground is prevented

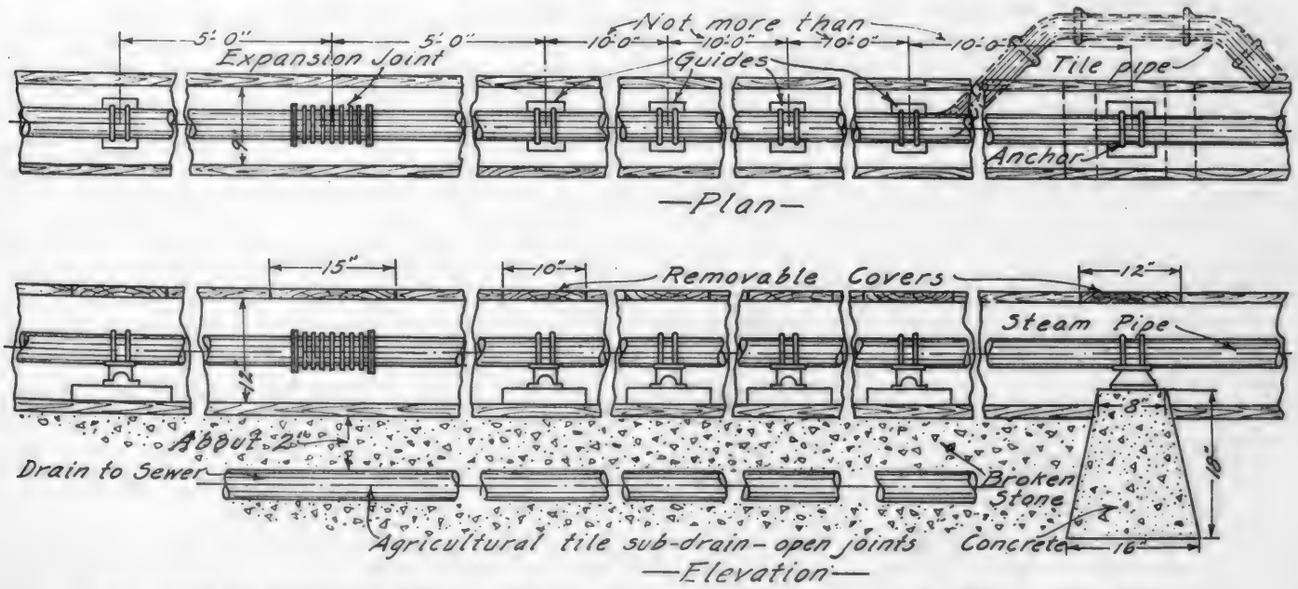


FIG. 3—USE OF EXPANSION JOINTS, ANCHORS AND SUBSURFACE DRAINS FOR SMALL STEAM MAINS.

from making contact with the steam pipe by the galvanized sheet metal shield of No. 22 U. S. G., bent as a curved deflector to shed the moisture. The box is packed with mineral wool. This is one of the best of non-conductors where there are no vibrations to cause it to settle to the bottom.

Sub-surface drainage is essential for underground steam mains since water will collect and flow along the trenches even when they are backfilled. If it enters the boxing it will rot the wood and cause excessive condensation of the steam. Where steam pipe covering is used it may be rapidly destroyed by water flowing along the outside of the pipe and the insulation properties of the covering reduced in particular by the latter sagging away from the pipe. When the fill is composed largely of cinders, ashes will wash along the bottom of the box and by collecting at the pipe supports will cause rapid deterioration at the point of contact.

Expansion joints, anchors secured to concrete piers, and sub-surface drainage are shown in Fig. 3. Four-inch argicultural tile drain is laid about 2 in. underneath the box throughout its length, the tile being with open joints for the entrance of ground water which it conducts to the sewer. The tile pipe passes around each concrete pier and is surrounded throughout by broken stone. Expansion joints, guides and anchors are made accessible by removable covers placed in the top of the boxing.

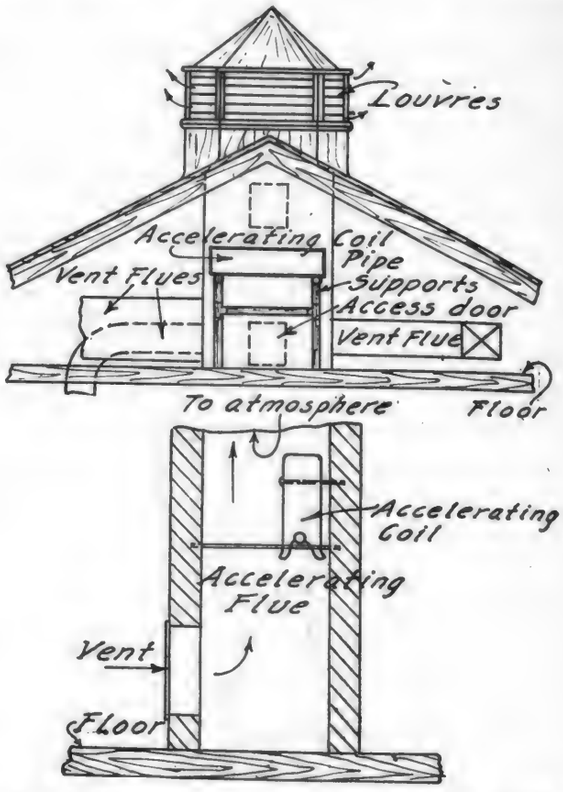
Notes on Accelerating Coils.

In gravity ventilating systems it is necessary to provide some other means for assuring a constant movement of air through the exhaust flues, otherwise they may be of little service. Ordinary exhaust flues are wholly dependent for their effective action upon atmospheric conditions. Local conditions may effect a movement of air in these flues, but this is sometimes downward in the form of "back drafts" which not only defeat the purpose but are also annoying.

To obviate these conditions, accelerating coils are installed in the exhaust flues. Since the effect of a flue depends upon the height of air column above the point to which heat is applied; it follows that the heaters should be located just above the exhaust register opening. In many instances, especially in small flues, this cannot be accomplished without a serious reduction in the flue area. For these reasons the flues are usually collected at a point in the attic and in this collection chamber the accelerating coils are installed. The methods as described are illustrated by the accompanying sketches.

The radiation in coils placed just above the exhaust register openings should be sufficient to increase the temperature of air 10°. When installed in this attic, this is increased to give a temperature rise of 20° in order to secure the same effect. It will be seen from this that the latter method is not so economical, though more practical and adaptable to conditions.

Either of these methods for exhausting vitiated air is objectionable, in that all heat as given up to the air is wasted to the atmosphere out-of-doors, none being used to heat the building. The cost of heat so applied, together with the cost of these coils exceeds



PROPER METHOD OF LOCATING ACCELERATING COILS FOR EXHAUST VENTILATION.

by from four to ten times the cost of power necessary to move equal quantities of air by means of engine or motor-driven fans. The exact ratio depends upon the local cost of fuel and electric current. It follows that the mechanical or fan system of exhaust is more economical and much to be preferred. The first cost is, however, somewhat greater.

Improving the Efficiency of Heating Systems.

Special emphasis has been laid recently on the opportunities awaiting the heating contractor in the examination of existing plants with doubtless, first among the usual defects in a heating system, are those of the chimney or flue. This is a subject within itself and of which so much has been said or written that further comment is unnecessary.

Proceeding then, with the parting warning to look well into the design and condition of the flue, let us consider the next thing, which is the smoke pipe. Too long a horizontal smokepipe between the boiler and chimney will affect the chimney draft, though this is not a disadvantage where the draft is by far sufficient. Taking the case of a stove set in the front of a long store or billiard room in which the flue is at

the rear, considerable heating of the interior of the room may be done by the pipe itself.

On the other hand, if the draft is less than that desired and the smokepipe is very long, say 40 ft., it would be well if this cannot be otherwise remedied, to cover the pipe in a thorough manner. Such a long uncovered smokepipe may, without considering the frictional resistance, have the same effect as lowering the stack about 15 ft.

If called upon for corrections or suggestions, the entire heating system should be carefully gone over, checking up the amount of radiating surfaces, size and condition of boiler and pipes, condition of fire and ash pit, kind of coal used, method of firing and frequency.

See that the radiation is increased proportionately on that side of the building which is exposed to the prevailing winter winds. This must be done to secure an even distribution of heat, since the wind pressure forces fresh air into the room, causing a more frequent air change.

The owner should be consulted as to which rooms are cold and the amount of radiation for such room checked up. In the consideration of each room, note the local conditions, such as sun or wind exposure, loosely-fitted windows, and the use of weather strips, tightening the sash where necessary.

Ascertain in a water heating system if the temperature of the water is maintained steady or variable, for if the radiation has been figured on the basis of 180° boiler temperature, while the temperature of the water is lower, the radiation should be increased accordingly. The thermometer should read correctly, the expansion tank be of adequate capacity, while the mains should favor the lower floor, as it is usually an easy matter to send hot water to the upper radiators.

Examine the supply and return piping in the cellar for evidences of short-circuiting, and note if all sections of the radiators are hot. Feeling by hand each run of piping, will soon locate the spot where the temperature drops and very likely instantly disclose the reason, whether caused by pockets, improper pitch, air binding, method of dripping, a bull-head tee or flow in opposition.

In water heating systems in which there is no adequate provision for venting the air, the owner may be instructed to regularly vent certain radiators of their collection of air.

The method of making connections is more often the cause of short-circuiting. Removal of unnecessary fittings, reconnecting the supply branch from the top instead of the side, increasing the pipe size or restricting the flow of the more positive, will in many cases overcome the difficulties.

The apparatus for draft regulation should be noted and how operated by the owner, recommending automatic regulators where advisable.

Water-line troubles in steam boilers are common, and are caused by lack of sufficient distance between the boiler water-line and the dry return to overcome the inequality of pressure within the heating system. This is often more noticeable when the system is first heating.

Our New Size.

EDITOR HEATING AND VENTILATING MAGAZINE:

The change you have made in the January number of the magazine has greatly improved its appearance and will have a good result.

F. E. BURPEE.

Lewisburg, Pa.

EDITOR HEATING AND VENTILATING MAGAZINE:

I have just received your January, 1920, issue of THE HEATING AND VENTILATING MAGAZINE and note the change in size, etc. It gives me pleasure to congratulate you on this issue. It shows up fine, and I certainly wish you every success.

Your field is a good one. There is a great future to it and it requires a high-class specialized magazine.

With every good wish for your success, I remain. Yours truly,

T. N. THOMSON.

Scranton, Pa.

EDITOR HEATING AND VENTILATING MAGAZINE:

I wish to congratulate you and your associates upon THE HEATING AND VENTILATING MAGAZINE as it appears in its new dress. I predict a very rapid growth of influence and activity for you. With best personal regards, very truly yours.

J. D. HOFFMAN.
Director, Department of Practical Mechanics, Purdue University.

Lafayette, Ind.

EDITOR HEATING AND VENTILATING MAGAZINE:

The January edition is fine—much better than the old form.

ILG ELECTRIC VENTILATING CO.
G. C. Breidert, Manager Sales Promotion.

Chicago, Ill.

EDITOR HEATING AND VENTILATING MAGAZINE:

Your magazine in its new form has reached us and we are very pleased to congratulate you on its excellent appearance and also on the character of the contents. We wish you every success.

DOMESTIC ENGINEERING.
Charles H. Bishop, Associate Editor.

Chicago, Ill.

EDITOR HEATING AND VENTILATING MAGAZINE:

I wish to congratulate you on your new magazine for 1920. Very truly yours,

JOHN L. MAC VICAR.

Wollaston, Mass.

EDITOR HEATING AND VENTILATING MAGAZINE:

I wish to congratulate you on the appearance of the magazine in its new size. I believe it now measures up to my high opinion of the character of its contents.

New York. F. A. FISHER.

EDITOR HEATING AND VENTILATING MAGAZINE:

Your magazine in its new size looks "great."

New York, ALBERT G. YOUNG.

MODERN PRACTICE IN VAPOR HEATING

EDITOR'S NOTE: For the purpose of this series of articles, a vapor, vacuum, vapor-vacuum, vacuum-vapor, atmospheric, modulated or thermograde system of heating will be considered as any system in which the steam pressure ordinarily carried is practically at atmosphere or slightly below or in which the returns are open to the atmosphere and where no pump or other positive mechanical device is employed to pull back the returns.

XIX—THE RICHARDSON VAPOR-VACUUM-PRESSURE SYSTEM.

While operating usually without pressure and most of the time under a partial vacuum, the Richardson system is characterized as a combination of vapor, vacuum and pressure heating. As in the other vapor heating systems described in this series, the Richardson system does away entirely with the use of air valves, the air and condensation being carried back through the return connection at the bottom of the radiator. This connection, shown in Fig. 4, is probably the most characteristic feature of the system.

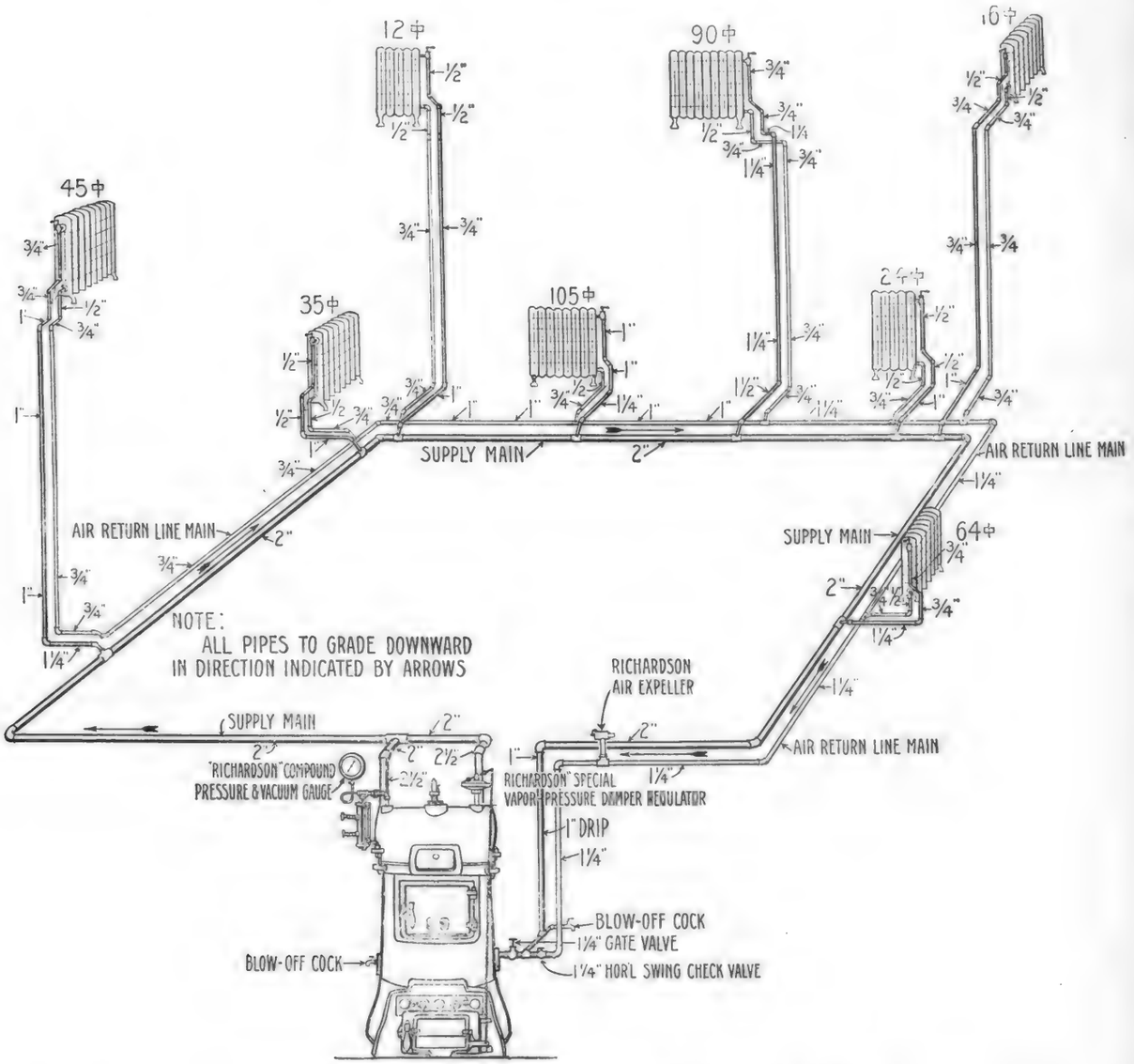


FIG. 1—PLAN OF SINGLE CIRCUIT FOR MODERATE SIZE SYSTEMS.
Note that the air line begins at the radiator first supplied with steam.

FIG. 3—RICHARDSON PACKLESS GRADUATED SUPPLY VALVE.

but a few ounces. The manufacturers recommend the use of exactly the same amount of radiation as would be required for a gravity steam job, using hot water pattern radiators.

The accompanying illustrations, Figs. 1 and 2, give a general idea of the arrangement of the supply and return mains, showing one circuit for a small building and two circuits for a large one. Many times, of course, it is necessary on large jobs, to use three or four separate mains. A separate air line must be run in connection with each separate supply main, with an air expeller and vacuum valve for each separate air line main. Two air line mains should never be connected to one expeller.

Each air line return main must be started where the first radiator is taken off the supply main and the air line return extended through, with the steam main running parallel to same, pitching down the same as the steam main and increasing in size to provide for the added connections. The accompanying tables

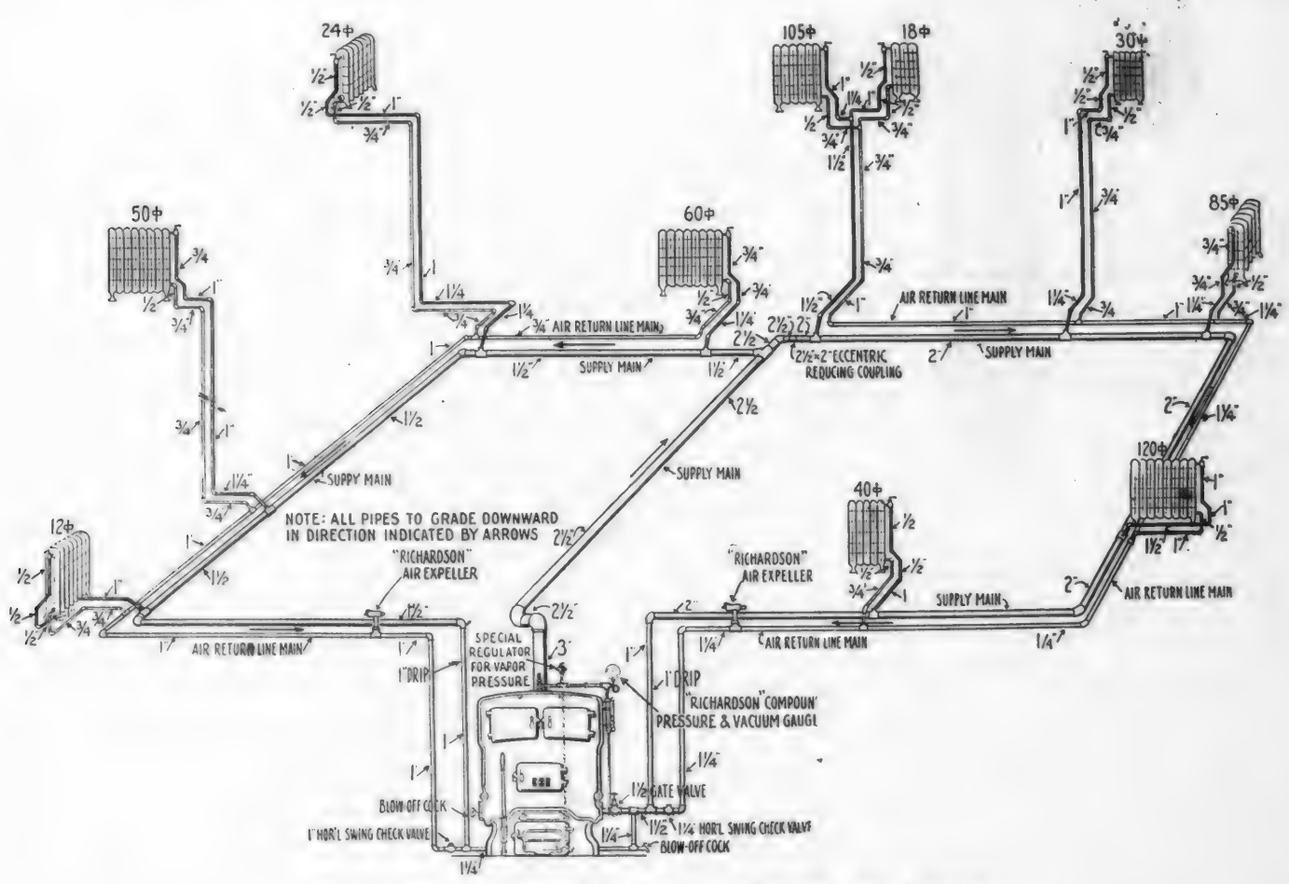


FIG. 2—PLAN OF DOUBLE CIRCUIT FOR LARGER SIZE SYSTEM.
Note that each air line begins at the radiator first supplied with steam.

The water is returned to the boiler and the air passes off through a special air expeller and vacuum valve (Fig. 5). Air thus passes freely from the system, the valve closing when vapor or steam reaches it and remains closed so long as there is a vacuum in the system. Under these conditions vapor will circulate freely to all parts of the system with a pressure of

FIG. 4—RICHARDSON WATER-SEAL BALL-CHECK UNION

give full information as to the size of air line return necessary for different amounts of radiation.

Supply Mains Not Exceeding 100 Lin. Ft. in Length.

Sq. Ft. Radiation	Pipe size, In. Diam.
150	1 1/2
400	2
600	2 1/2
1000	3
1400	3 1/2
2000	4

Air Line Return Mains.

Sq. Ft. Radiation	Pipe size, In. Diam.
80	3/4
200	1
800	1 1/4
1500	1 1/2
4000	2

FIG. 5—RICHARDSON AIR EXPELLER AND VACUUM VALVE

Risers Up to 30 Lin. Ft. High.

Sq. Ft. Radiation.	Supply Riser In. Diam.	Return Riser In. Diam.
20	3/4	3/4
60	1	3/4
100	1 1/4	3/4
180	1 1/2	3/4

Wet Return Mains.

Sq. Ft. Radiation.	Pipe Size, In. Diam.
400	1
1000	1 1/4
1800	1 1/2
5000	2

These tables are based on the assumption that no unusual conditions prevail and that the radiation is sufficient to maintain a temperature of 70°. All lateral supply pipes connecting supply mains to vertical pipes and risers, also runouts or expansion pieces under floors, which connect supply risers to radiators, should be at least one size larger than the vertical pipes or risers, provided same are under 4 ft. in length and at least two sizes larger when over 4 ft. in length.

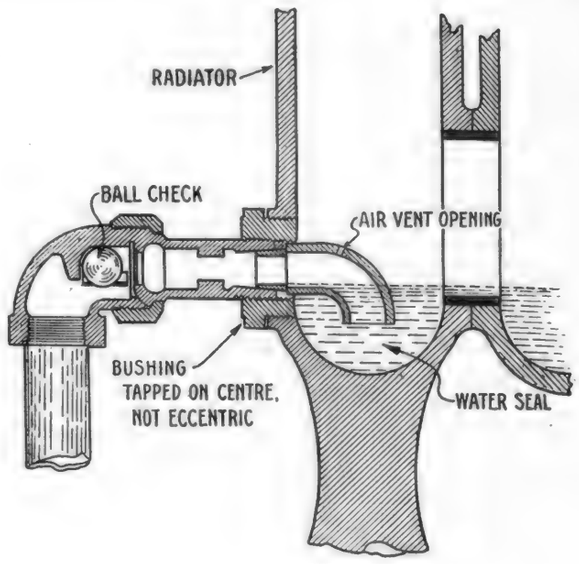


FIG. 6—OPERATION OF BALL CHECK AND WATER SEAL.

Emphasis is laid on the need of having the proper grade or pitch to the pipe to secure successful operation. All lateral pipes or branches in cellars and all horizontal pipes under floors (both supply and return) should have a grade of at least 1 in. in 2 ft. The supply mains and air return line mains should have a grade of 1 in. in 20 ft., and if pipes are straight and true, it will be of no advantage to have more grade. On the other hand, in low cellars, it would be a decided disadvantage, for the reason that at least 24 in. is required between the water-line of the

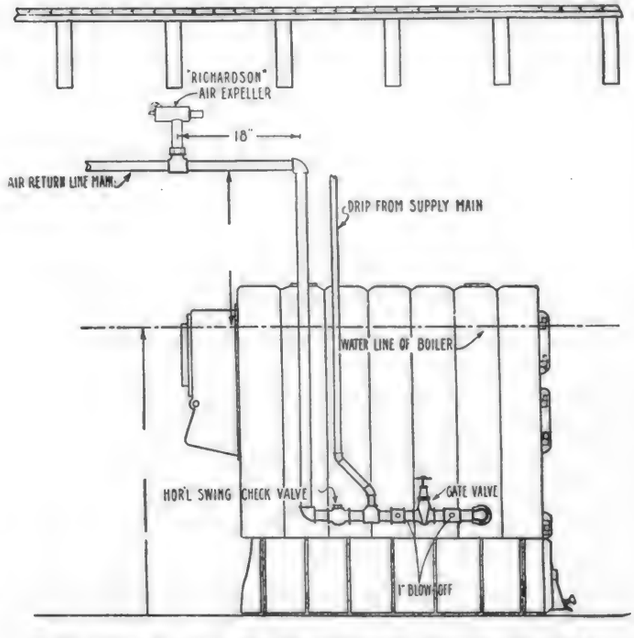


FIG. 7—DETAIL OF RETURN CONNECTIONS AT BOILER.

boiler and the low point of supply and air return line mains. A clearance of 30 in. is better than 24 in., and on large installations or long mains the minimum clearance should be 30 in. and 36 in. is recommended as being even better.

Fig. 6 shows the manner in which the water-seal ball-check union elbow is connected to the radiator. This also shows that it is necessary for the return connection in the radiator to be a center-tapped bushing. If the tapping is solid, the tail piece strikes against the inside of the section. If the tapping is eccentric, it comes too close to the bottom of the section.

A detail of the return connections at the boiler is shown in Fig. 7. The proper method of connecting the air return line and the drip from the main back into the boiler is illustrated, together with the connection to the air expeller and the proper location of this device. A horizontal swinging check valve should be placed on the air return line below the water-line, before the drip from the supply main is connected with a gate valve on the connection to the boiler.

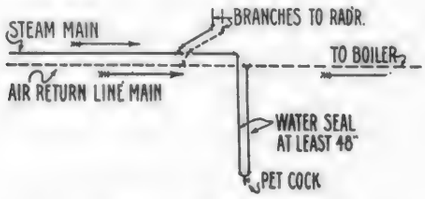


FIG. 8—ARRANGEMENT OF WATER SEAL.

Where a water seal is used, it should be arranged as shown in Fig. 8. Where the steam main ends a long distance from the boiler and it is not desirable to bring back a wet return, the drip from the steam main can be connected into the air return line in the manner shown.

Quite frequently it is difficult to get the proper distance between the low point of the main and the water-line of the boiler, because of girders extending down below the floor beams. Where this condition is met, the proper grade of the mains can be secured by following the arrangement shown in Fig. 9. This will give the same result as if the pipe had been carried straight through. The bottom of the loop will, of course, be filled with water and it is necessary to leave a tee as shown, with one outlet plugged so that the water can be drawn off if it is necessary at any time.

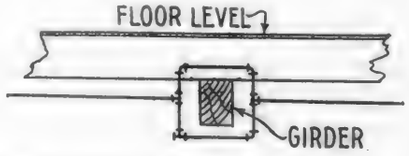


FIG. 9—ARRANGEMENT FOR RUNNING MAINS UNDER GIRDERS.

Fig. 10 illustrates graphically the grade which should be allowed on all branches. The upper pipes show a lateral branch from the main to the riser or first-floor radiator connections. The grade should be double what is ordinarily allowed. The bottom pipes show laterals carried under the floor, from the top of the riser to the radiator. Special care should be taken to see that these pipes have double the usual pitch.

The water-seal ball-check union elbow (Fig. 4) used with this system is made in only one size, 1/2-in., which is stated to be ample for all radiators. It is placed at the bottom of the radiator and operates as follows:

When the supply valve is opened, the ball check opens and allows the condensation to pass freely into the return. If the supply valve is closed tight, the ball check closes to prevent water or vapor from backing into the radiator. This return valve, it is pointed out, is entirely automatic. The air vent opening in the tail piece of the elbow equalizes the pressure on both sides of the water seal, preventing siphoning. It also allows the air in the radiator to escape into the return as soon as the supply valve is opened.

FIG. 10—GRADES TO BE ALLOWED ON ALL BRANCHES.

The Richardson system is manufactured by the Richardson & Boynton Co., New York.

Ashes Raised 86 ft. in Hotel by Suction System.

The problem of removing ashes from big hotels and department stores calls for considerable ingenuity, especially where the space available is strictly limited. One Chicago hotel (the Morrison) has met this difficulty by installing a steam ash conveyor. The ash intake is down 56 ft. below the street level; the discharge point of the system is 30 ft. above the street level, or 86 ft. above the intake. The ash hopper is so built over a driveway that it can be readily cleaned simply by withdrawing the ashes into dump wagons.

The system consists of two suction branches united at a patent steam unit, the discharge line from which rises directly to the ash hopper above.

ASH CONVEYOR SYSTEM IN MORRISON HOTEL, CHICAGO.

The riser is of special interest as it is the highest yet constructed in the steam conveyor field. There is no angle or booster steam unit in this riser—the twin unit easily forces the ashes up the long conveyor line to the discharge point.

CORRESPONDENCE

Problem in Laundry Water Heater.

EDITOR HEATING AND VENTILATING MAGAZINE:

One of my customers has a steam water heater in his laundry, having a storage capacity of 1150 gal. Heating surface in copper tubes located low in shell capable of condensing 74 H. P. of exhaust steam when water surrounding tubes is 100° F. Cold water enters shell directly under tubes and is so arranged that cold water and hot water in heater do not mix appreciably but stratify, the upper portion being hot and the lower portion cold. Hot water outlet is at top on end opposite from inlet. (See sketch).

During periods of heavy draft, extending from April until November, the lower half of heater never becomes hot and all exhaust steam from entire plant that passes through feed-water heater is condensed in this heater, the exhaust pipe from heater to roof being cold. During the winter months, when little water is drawn, the water heater becomes hot to within a few inches of the bottom of shell and a very small amount of exhaust steam is wasted—perhaps 3% of the total engine H. P. for entire year—and wasted only during period of small requirements.

The hot water supply for winter use is adequate, but insufficient during the summer when large drafts occur and when exhaust steam does not give half the hot water desired. It seems undesirable to use live steam, and the owner had in mind the installation of a supplemental coal-burning water heater.

A visitor at the plant condemned the present heater because of cold water inlet being close to tubes which contains exhaust steam. He claimed that the owner did not fully get the benefit of heat in exhaust steam when it became condensed by cold water surrounding tubes immediately on entering heater. He advised changing heater so that cold water would enter at end opposite from tubes and mix with warmer water in heater, claiming that by this means the exhaust steam would be better diffused throughout interior of tubes and thereby give a greater amount of hot water.

He advised, in addition, the installation of another heater, the same size as present one, with cold water inlet on end opposite from tubular heating unit and that the exhaust steam flow through the upper heater and then through the lower heater. He also advised that the feed-water heater be disconnected from present exhaust line and supplied with steam from boiler-feed pump only.

1. Is it desirable to run all exhaust through feed-water heater and get as high a temperature as possible for boiler feed-water or would pump exhaust alone give a sufficiently high temperature?

2. Will any greater number of heat units be transferred from exhaust steam to water by having cold water inlet located away from copper tubes containing exhaust steam or by having warm or hot water instead of cold surrounding tubes?

3. If all exhaust steam is now condensed in present feed-water and service-water heaters during conditions of severe draft, is laundry owner getting all possible benefit from exhaust steam?

4. Would the addition of another big heater at an expense of about $800 give a sufficient increase in hot water to warrant the expense?

Philadelphia, Pa. W. W.

1. Yes, particularly if the condensate is wasted from the coil in the water heater. In accordance with changes involving the least expenditure of money, the exhaust piping can be arranged and valved for joint use of both heaters or left as now existing for first use at feed-water heater. The latter is necessary in order to save the 3%, more or less, of the total engine H. P. for the entire year wasted during periods of small requirements.

This method, however, is not an important item,

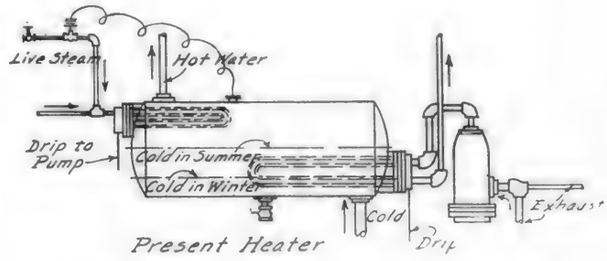


FIG. 1—PRESENT ARRANGEMENT OF HEATER.

since with all exhaust utilized in both heaters, as seems apparent, no difference will exist in the required amount of coal burned on the grate, whether all or part of the exhaust be run to either heater. If the exhaust to the feed-water heater be reduced, then the required make-up live steam to the water heater will be reduced in like amount, the quality of coal burned being the same in each case.

This is more clearly shown in Fig. 4 in which 1500 heat units are assumed as required at the water heater, while the heat units in the available exhaust steam are, say 1000 B. T. U. In each of the three cases shown it will be seen that the coal burned should be sufficient to furnish 500 heat units absorbed by the boiler.

Whether or not the pump exhaust alone would give a sufficiently high feed-water temperature is a question that cannot be answered without data, such as the amount exhausted. Furthermore, the power and heat-

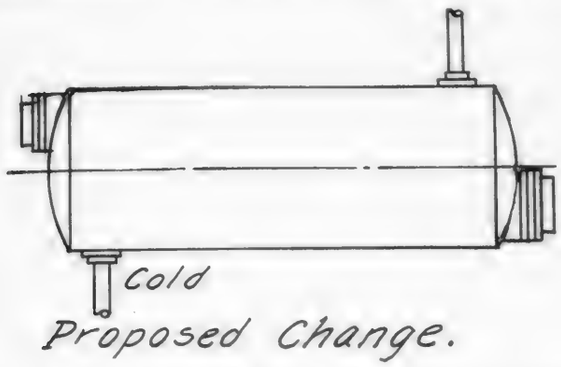


FIG. 2—CHANGE IN HEATER PROPOSED BY CORRESPONDENT.

ing loads are not given, though in most cases the exhaust from boiler-feed pumps is insufficient for the purpose in mind. Water should not enter the boiler so cold as to set up severe stresses in the boiler plates due to alternate expansion and contraction.

2. The greater the temperature difference, the greater the transmission. On the other hand, where the entering cold water is allowed to pass directly over the steam tubes, there may be considerable condensa-

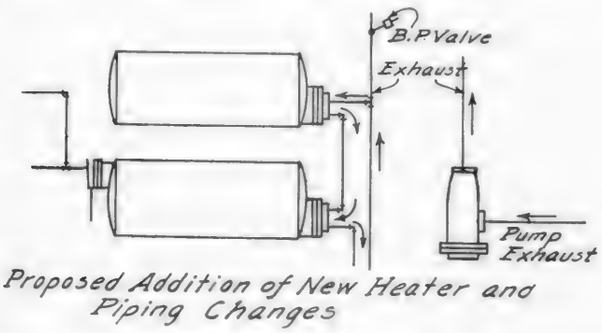


FIG. 3—ADDITION OF NEW HEATER AND PIPING CHANGES PROPOSED BY CORRESPONDENT.

tion at this point within the tubes, which, unless rapidly removed, impairs the efficiency of the heating surface; since the temperature of this condensation is lower than that of the steam. In general, it is advisable to arrange connections so that the temperature difference and the amount of condensation are about equal throughout the tubes, a thing which may be accomplished by having the hottest water surrounding the tubes with the hottest steam, while the cold water circulates over the colder tubes.

This is not an important item in the present case where the difficulties seem due to other causes. As stated by the correspondent, the heater is uniformly hot when the demands are not in excess of the heaters' rated capacity. While cuts in manufacturers' catalog generally show connections as recommended by the correspondent's advisor, they may be readily reversed, as is often done to suit piping requirements.

3. This question answers itself in the affirmative and the correspondent mentions elsewhere, that at such times, the exhaust pipe from the water heater is cold.

4. This depends upon the capacity of the boiler, together with the number and kind of laundry fixtures, which latter determine the hot water demand. The correspondent does not state whether the 100° temperature of water is the mean and whether the horsepower is in terms of engine or boiler. Possibly the engine is running at 50% load.

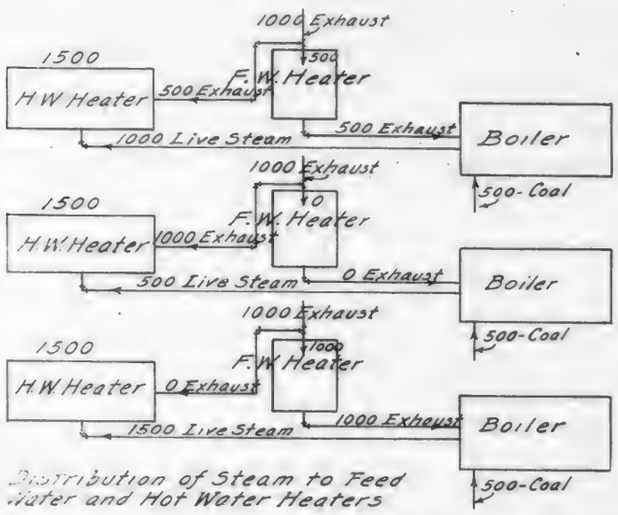


FIG. 4—SUGGESTED ARRANGEMENT FOR DISTRIBUTION OF STEAM TO FEED WATER AND DOMESTIC WATER HEATERS.

Apparently the amount of exhaust and heating surface are both insufficient. The exhaust can be supplemented by live steam and the heating surface increased within the present heater if conditions permit. The present live steam coil is located at the point where the hottest water accumulates and in this case it would be better if the connections were reversed. It is not clear, so long as the exhaust is insufficient, why, as the correspondent states, it is undesirable to use live steam.

After a more thorough study of the requirements, the correspondent will doubtless find that the installation of another large heater is unwarranted, since a water-tube heater of the instantaneous type having the same heating capacity, but without storage capacity, may be installed at about one-third the cost. This will be a heater of much smaller size which can be mounted adjacent to the present one or otherwise arranged to suit piping and method of supporting. However, its selection or that of any other heater, would not remedy the situation if the boiler capacity is not sufficient.

There seems to be no particular advantage in the placing of heaters one above the other with piping connections as shown in Fig. 3. The condensation in the tubes of the upper heater might restrict the flow of exhaust steam to the lower heater. It would be better to connect the piping so that exhaust steam can be used in either or both heaters as required.

A method of piping is proposed as shown in Fig. 5. By-passes and valves are used throughout, while the exhaust will flow to the point of greatest condensation which will be in the first or lower heater where the cold water enters. The final temperature of outgoing hot water will be regulated by make-up live steam in the upper heater. The lower heater of the instantaneous water-tube type will add the required additional heating surface at a lower first cost, while the upper

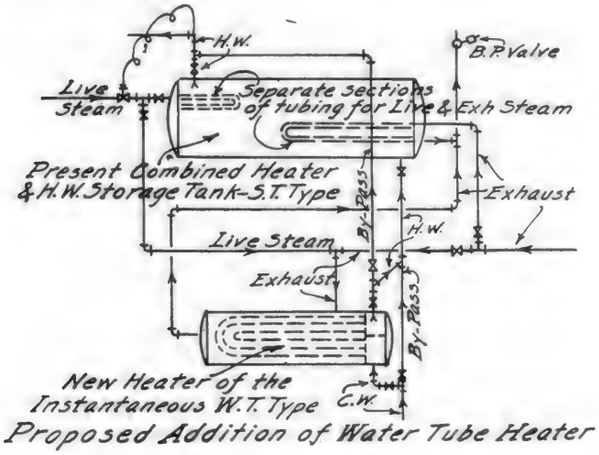


FIG. 5—PROPOSED METHOD OF PIPING, MAKING USE OF ADDITIONAL WATER-TUBE HEATER.

and present heater of the combined heater and hot-water storage-tank type will take care of the storage. Either heater can use live steam or exhaust, and may also be cut out as desired. Hot water should flow from the lower to the upper heater, though it may be by-passed when desired with the temperature regulator connected to the elbow, and as otherwise shown. If the hot water by-pass is used, water as drawn would take the line of least resistance, which is through the steam-tube heater and in this way short circuit the other heater.

Boiler capacity will determine what method should be followed. With a limited amount of steam too small for peak requirements and with a variable demand, the steam-tube or combined water service heater and storage tank is best and most economical. The stored water gradually absorbs the heat while in reserve for the maximum demand which may be only for a brief period. Therefore, only a small, continuous supply of steam is required while the demand on the boiler is less. It is especially desirable in laundries where a number of fixtures are suddenly put in operation at remote periods.

In the instantaneous or water-tube type of heater, the water circulates in the tubes and no storage space is provided nor should a storage tank in first installations ordinarily be used with this heater. If this is desired, the combined heater and storage tank will be found more economical. The instantaneous type of heater is more frequently confined to circulating systems and large installations where the demand is practically continuous and it is economical in large power plants where there is always available an ample supply of steam at intermediate pressures. Since heat can be stored in the steam and used to heat the water only as required no storage space is provided. This necessitates an increase in the amount of pipe surface to meet the maximum demands for hot water. Further, the boiler which supplies steam to the heater must be large to meet the demand; whereas, with the storage type the hot water is stored and the effect of the maximum demand is lessened, thereby allowing a more uniform rate of operation. The elimination of sudden demands is particularly important where the boiler capacity is limited.

In designing a new installation, the foregoing are the principles which should be kept in mind, but circumstances alter cases and in the present instance, where an addition is to be made and first cost considered, doubtless the instantaneous type will prove the more desirable. Guided by these remarks, the correspondent can best determine this point, as he alone is in possession of all factors entering into the situation.

The owner would not benefit by the installation of a supplemental coal-burning water-heater unless the boiler capacity is insufficient. It is more economical to burn the total amount of coal under the one boiler.

Finally, the present heater, exhaust and hot water piping should be covered with non-conducting covering, wastes being checked up and prevented.

Piping arranged with a bottom and top connection for circulation of water within water storage heaters has sometimes produced results. The action is produced by the cooling effect of the exposed pipe. With circulation established, the pipe tends to heat and destroy the action by lowering of the hot water. However, this will not occur if there is an occasional drawing off of water for use.

Radiation Loss in Uncovered Galvanized-Iron Ducts.

EDITOR HEATING AND VENTILATING MAGAZINE:

In the December issue of THE HEATING AND VENTILATING MAGAZINE there appears an article dealing with the radiation losses in uncovered galvanized-iron ducts. A typical example is worked out in the article. The third column of data in this example is headed "Loss per 100 ft., B. T. U." From the previous statements and from the curves shown, it seems to the writer this should read, "Drop in temperature, Deg. F., per 100 ft." The first three numbers under this heading appear to have a decimal point one place too far to the left. Thus, from the curves, the first

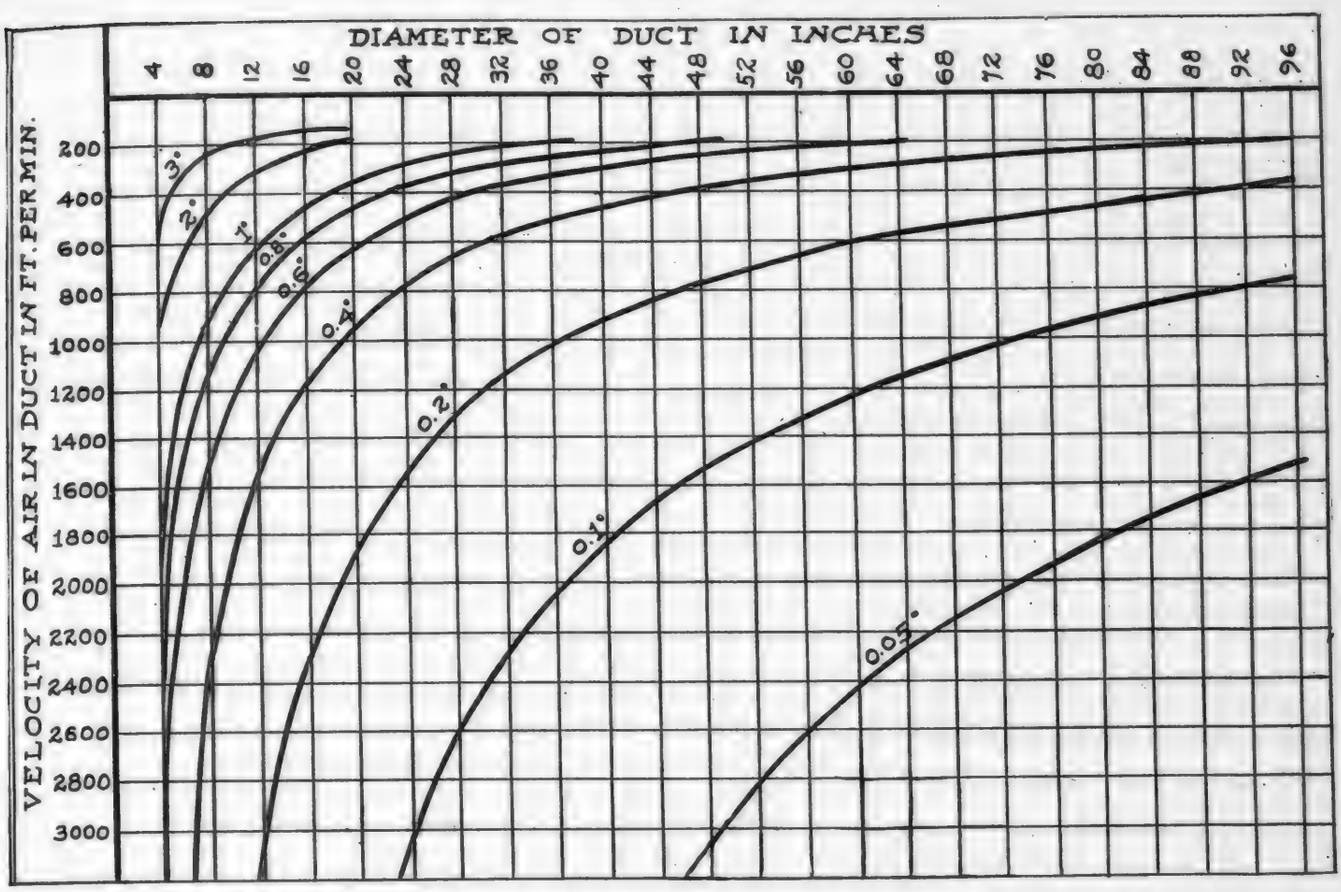


CHART PUBLISHED IN DECEMBER, 1919, ISSUE, SHOWING DROP IN AIR TEMPERATURE FOR UNCOVERED GALVANIZED IRON DUCTS PER DEGREE AVERAGE TEMPERATURE DIFFERENCE PER 100-Ft. RUN.

ngure should be 0.15, the second 0.31, the third 0.8, while the fourth is correct as it stands. Making these changes the total for one degree average temperature drop would be 1.35, in place of 0.591. The heading for the last column, I believe, should also be changed to read, "loss in temperature" instead of "B. T. U."

Referring to the last two lines of the article, if we multiply 1.35 by 70 we get 94.5 degrees temperature drop, which is greater than the original temperature difference between the air in the pipe and the air outside of the pipe. This, of course, is impossible.

The difficulty appears to be either in the assumption of the constant K, 1.53, or else in determining the average difference in temperature between the duct and the outside air. The average difference would not be 131 minus 60, but would be considerably less, depending upon the temperature of the air in the end of the pipe. This average difference, it seems to me, would be very difficult to determine except by trial method. I do not know that we are justified in using the constant, 1.53, as the conditions in a radiator are considerably different from those in a galvanized-iron air duct.

F. B. R.

Minneapolis, Minn.

The article referred to by our correspondent, especially the chart which accompanies it, is one of considerable interest to the heating and ventilating engineer, since it affords a logical working basis on which to calculate the allowances necessary for uncovered ducts. Although the various formulas and the method of using the chart are correct, the points made by our correspondent regarding the example given are well taken. The decimal points are, however, correctly placed in the chart. In the matter of the headings, "Loss per 100 ft., B. T. U." and "Drop in temperature, deg. F." these do not change the result materially as they amount to practically the same thing in either case, while previous statements also mention B. T. U. losses.

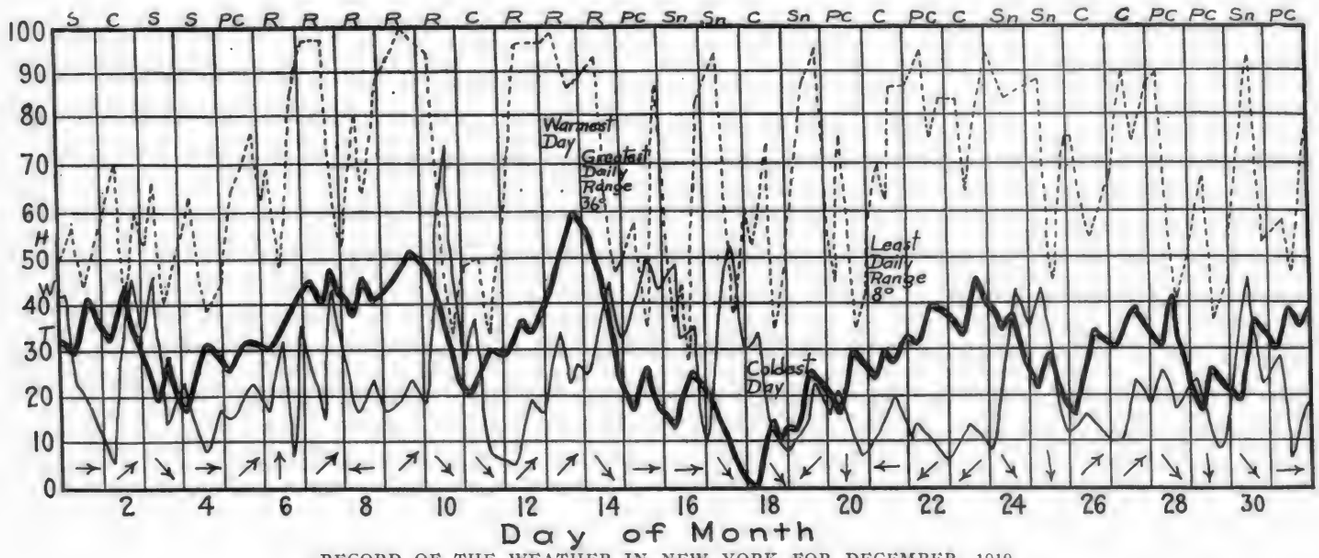
There is obviously an error in the article either in the assumption of the constant K, 1.53, or else in determining the average difference in temperature between the duct and the outside air. The proper figures for these two conditions will make the rest of the data correct, and these would not be difficult matters to determine by test.

Referring to the different conditions in a radiator and in a galvanized-iron duct, it will be noted that the coefficient given of 1.53 applies to a sheet metal radiator. It is probably true, however, that the steam in a radiator is more or less wet, while there is a certain amount of air binding within the radiator. In ducts, the velocities may be much greater. The constant for corrugated iron walls is 1.13 and this figure may well be used as more nearly approximating actual conditions. The temperature difference should, no doubt, be $120 - 80 = 40$ degrees, since ducts are usually confined and the air near the ceilings is higher in temperature.

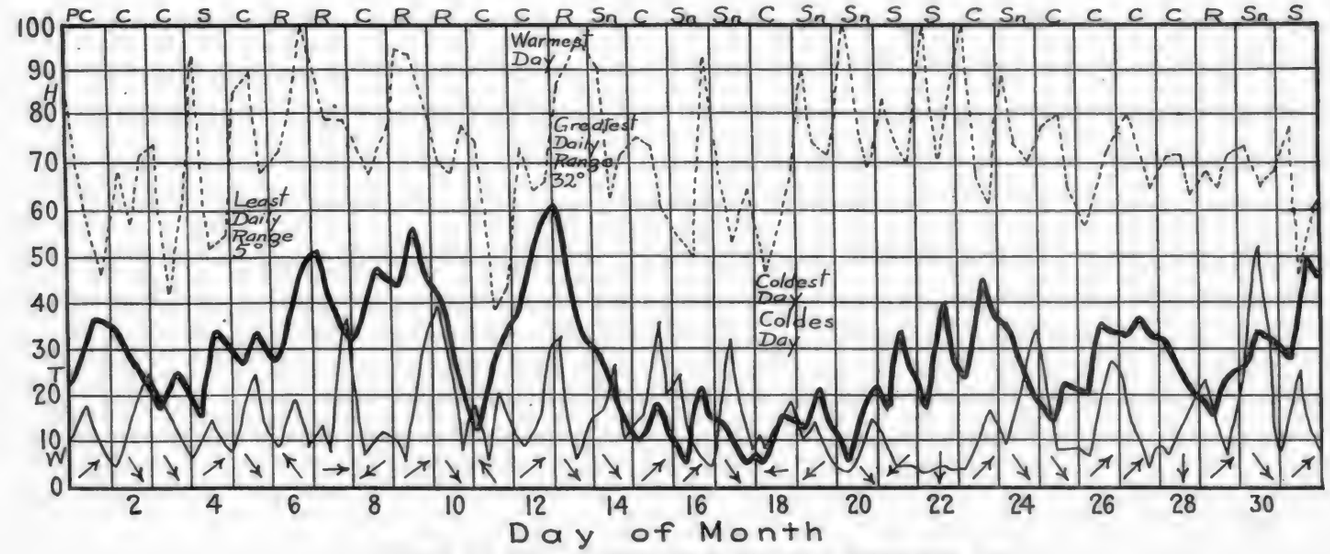
With these corrections applied to the two conditions, the temperature drop will be only 38.35°, which is quite possible. If the constant K be taken as 1, then this drop lowers to 34.29°. It is doubtful whether the temperature difference warrants further change and a still lower value for K will not appreciably affect the final result.

THE WEATHER FOR DECEMBER 1919

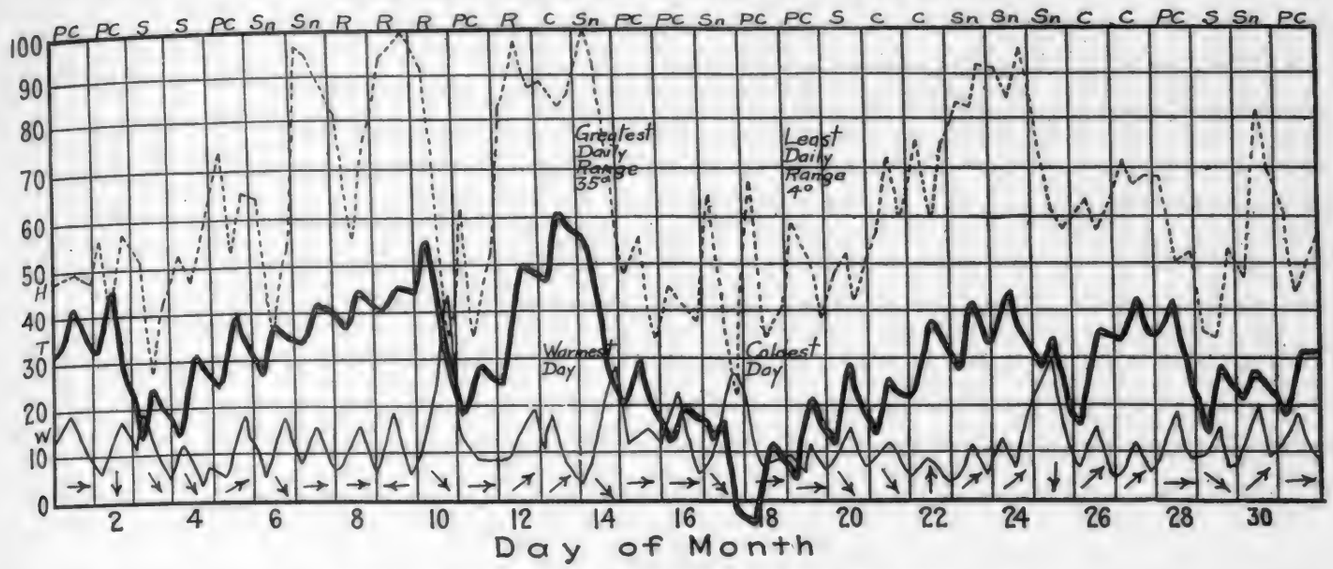
	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, degrees F.	60	62	61	44	56
Date of highest temperature	13	12	13	12	12
Lowest temperature, degrees F.	0	6	–6	–8	1
Date of lowest temperature	18	18	18	10	10
Greatest daily range, degrees F.	36	32	35	30	36
Date of greatest daily range	14	13	14	12	12
Least daily range, degrees F.	8	5	4	4	5
Date of least daily range	21	5	19	18	28
Normal temp. for month, degrees F.	30	28	29	21.4	29.6
Normal mean temp. for month, degrees F.	34.4	34.7	31.6	29.3	35.5
Total rainfall, in.	2.53	2.88	1.63	0.7	1.22
Total snowfall, in.	7.9	8.6	2.9	8.2	0.3
Normal precipitation, this month, in.	3.45	2.73	3.41	2.07	2.23
Total wind movement, miles	12815	8709	7430	8837	9148
Average hourly wind velocity, miles	17.2	11.7	10	11.9	12.3
Prevailing direction of wind	N. W.	N. W.	W.	W.	N. W.
Number of clear days	5	5	4	6	10
Number of partly cloudy days	9	3	14	6	5
Number of cloudy days	17	23	13	19	16
Number of days on which rain fell	8	5	4	1	4
Number of days on which snow fell	6	7	7	8	2
Snow on ground at end of month, in.	1	1	0.5	Trace	Trace



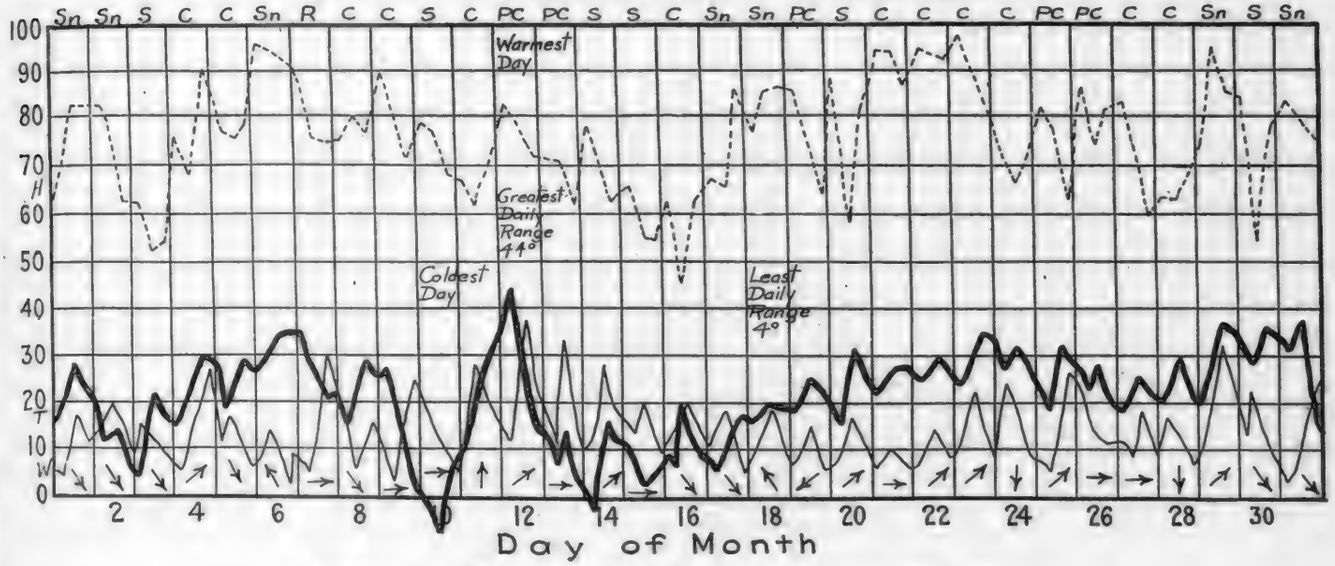
RECORD OF THE WEATHER IN NEW YORK FOR DECEMBER, 1919.
(Hourly Observations of the Relative Humidity Plotted on this Chart.)



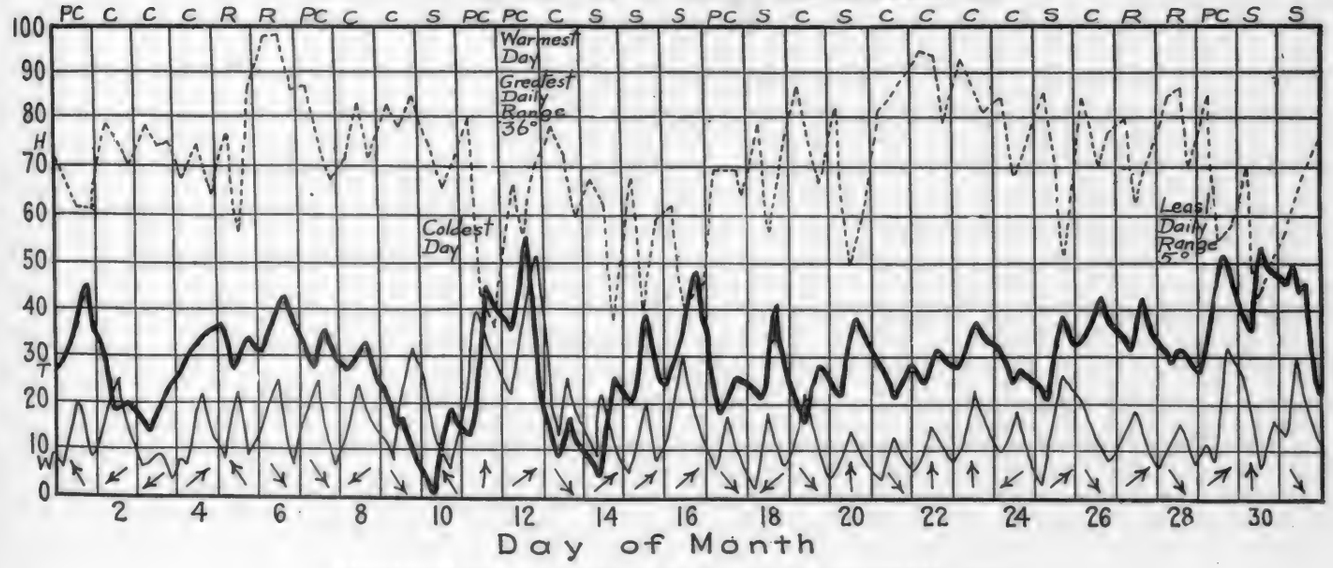
RECORD OF THE WEATHER IN BOSTON FOR DECEMBER, 1919.



RECORD OF THE WEATHER IN PITTSBURGH FOR DECEMBER, 1919.



RECORD OF THE WEATHER IN CHICAGO FOR DECEMBER, 1919.



RECORD OF THE WEATHER IN ST. LOUIS FOR DECEMBER, 1919.

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate relative humidity n percentage from readings taken at 8 A. M., 12 M., and 8 P. M.
S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.
Arrows fly with prevailing direction of wind.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

The New President of the Heating Engineers' Society.

In electing Dr. E. Vernon Hill as its next president, the American Society of Heating and Ventilating Engineers has, for the first time, gone outside of the strictly engineering field for its chief executive. Dr. Hill's work, however, has, for many years, been of a highly technical nature in connection with problems of ventilation and he has come to be regarded as a leading authority on what constitutes good ventilation and the proper methods for testing air conditions. His "synthetic air chart" which was devised for use in connection with his work for the Chicago Department of Health, is now recognized as providing the most accurate method yet developed for determining the various elements that constitute good ventilation and their relation to each other.

DR. E. VERNON HILL.
The New President of the American Society of Heating and Ventilating Engineers

Dr. Hill has been in charge of the Ventilation Division of the Chicago Department of Health since 1912, and has been identified with numerous movements in the society to secure better ventilation for buildings, notably the drafting of the "Requirements for Model Compulsory Heating and Ventilation Laws," which comprised a set of minimum ventilation requirements for public and semi-public buildings. These were presented at the society's annual meeting in 1916 and were officially recommended by the society for legislation.

The other officers elected are:

First vice-president, Champlain L. Riley; second vice-president, Jay R. McColl; treasurer, Homer Addams. Members of the council: Joseph A. Cutler, A. C. Edgar, Alfred S. Kellogg, George B. Nichols, R. W. Pryor, Jr., Perry West and W. S. Timmis.

The newly-elected members of the society's Committee on Research, in charge of the Research Bureau in Pittsburgh, are G. E. Bennitt, B. C. Davis, S. E. Dibble, A. T. Lewis, G. W. Martin and W. S. Timmis.

Society's Journal to Be Made a Monthly.

Announcement is made that the Journal of the society will hereafter be issued as a monthly publication. This change, it is stated, is found necessary, not alone to care for the greatly augmented activities of the society, including the Research Bureau, but also to satisfy the diversified and multiplying requirements of the membership, the total of which has more than doubled since the Journal's inception in 1915.

One element of the society's development is the enhanced enterprise of the local chapters and the more frequent publication of the Journal is expected to be an important factor in facilitating the exchange of data and information between the chapters. The subscription price of the Journal has been made $3.00 per year and 35c for single copies.

Illinois Chapter Takes up Forced Water Heating.

"Water Heating by Forced Circulation" was the principal topic for discussion at the January meeting of the Illinois Chapter, held at the Chicago Engineers' Club, January 12. It was one of the largest meetings of the year, with over 80 in attendance. The subject was presented by Charles D. Allan and was illustrated by lantern slides. Mr. Allan gave details of an installation of forced water heating in a group of factory buildings and his talk was followed by a lively discussion. The committee in charge of the meeting was made up of Homer Linn, chairman; E. F. Capron, J. J. Haines, J. A. Cutler and J. E. Truitt.

New members elected were Clinton E. Berry, B. W. Brady, C. H. Currier, L. D. Emmert and R. C. March.

Kansas City Chapter Given Talk on Warm-Air Furnace Research.

The Kansas City Chapter was a victim of the fuel shortage in connection with its December meeting. The meeting was scheduled for the evening of December 5, but the fuel restrictions in effect at that time made it necessary to hold the meeting at noon.

Professor A. C. Willard, of the University of Illinois, was the principal speaker, giving an account of the research work being carried on at the Univer-

sity of Illinois in co-operation with the National Warm Air Heating and Ventilating Association. Professor Willard called attention to the bulletin issued by the university showing what had been accomplished in its warm air heating experiments.

Upon beginning this research work, said Professor Willard, two problems were uppermost and their solution is vital. One is the measurement of temperatures in air currents and correcting for the radiation effect, and the other is the measurement of air velocities. The difficulties met with in connection with these problems were explained at length, as well as the progress that has been made in their solution.

The speaker then told some of the facts that have been developed during the experimental work. These include the relation between the amount of heat given to first, second and third floors of a building when these floors are served by leaders of the same size and capacity, the effect of insulating the casing of a furnace, the sources of waste of heat, the temperature and velocity of air in all sections of a leader or stack, and other points, many of which, he said, were found to be contrary to present-day belief. One of these points was that the leaders to the first floor of a two or three-story building heated by a warm-air furnace, should be larger than is the common practice but emphasis was laid on the fact that the greatest problem that was now awaiting solution in connection with the investigation is the correct measuring of the velocity and volume of air moving at small velocities.

The January meeting of the chapter had as its principal topic for discussion, "Benefits of Association work." R. Ward Hillman, who will be remembered by many in the New York district when he was located at that point, was the chairman for the evening.

Talks on Fuel-Oil and Air Cleaning Before the Eastern Pennsylvania Chapter.

The December meeting of the Eastern Pennsylvania Chapter was combined with that of the local section of the American Society of Mechanical Engineers to discuss a topic of mutual interest, "Oil as a Fuel." The speakers of the evening were Henry Thomas, combustion engineer for the Sun Co., and E. H. Peabody, vice-president of the Babcock & Wilcox Co.

Mr. Thomas said the first oil well driven in Mexico was that by Doheny in 1901. As Mexico holds the center of the stage just now on the Eastern seaboard in connection with its oil supply, the statistics given by Mr. Thomas were especially interesting. The largest Mexican well, he said, gave 1,000,000 bbl. of oil per day for five days, but much of it was lost, owing to inadequate storage facilities. One well, opened in 1914, gave at the beginning 264,000 bbl. per day. This well is still in operation, but at a reduced rate. The wells of Mexico now produce from 10,000 to 60,000 bbl. per day. In February, 1919, there were 299 wells producing oil in Mexico, and up to this time 500 had been abandoned since 1901.

Mr. Peabody, the next speaker, stated that the important feature of an oil-burning plant is the furnace, rather than the burner, and the methods of admitting and controlling the air for combustion. He said there were no advantages in gasifying the oil completely before its combustion in the boiler burner. Comparing inside with outside mixers, Mr. Peabody favored the outside mixer, because atomization cannot take place inside a mixing chamber, but must occur at the orifice of the burner.

The speaker said he had never heard of any trouble from heating oil above its flash point, within reason, although the petroleum companies recommend a temperature of about 145° F. of the oil delivered to the steam-atomized sprayer. He believed the mechanical atomizer had an assured field for land service, as the firemen has nothing or little to do with the amount of steam that may be required to burn the oil. With steam atomization, he said, there is no limit to the amount of oil a man may waste.

It was brought out in the discussion that plants with a load factor of 60% or less might find it economical to use oil, but that a plant with a higher load factor would not. Mr. Peabody said he did not regard the question of load factor as a serious one, holding that in either case oil would show an advantage over coal from a combustion-cost standpoint. Mr. Peabody believed there was a large field for the Fess type of oil burner, consisting of a disc rotated by a motor to atomize the oil, this type being especially adaptable to small installations.

At the chapter's January meeting, which was held January 8 at the Engineers' Club, Philadelphia, the speaker was P. E. Landolt, of the Research Corporation, of New York, who gave an interesting address on "Air Cleaning by the Cottrell Electrical Precipitation Process." He described in detail the technical features of the Cottrell process and after his address showed a number of lantern slides and motion pictures of typical installations and what had actually been accomplished in cleaning gases which were ordidarily discharged as waste. Mr. Landolt also had a small model of a Cottrell plant which he put into operation and those present were able to note its operating characteristics and its efficiency.

Recent Practical Measures Taken by Engineers to Meet the Industrial Crisis.

Out of the agitation that has been sweeping engineering circles during recent months for greater activity and co-operation on the part of the engineer in connection with the industrial condition of the country, have come some important measures which were adopted by the American Society of Mechanical Engineers, at its recent annual meeting in New York. The resolutions as proposed precipitated a vigorous discussion during which it seemed several times that their fate was sealed, but they were finally adopted in the following form:

Resolution 1. DECLARATION OF PRINCIPLES. Social and industrial unrest result from the fact that human relations have not kept step with economic evolution. Competent directive management of essential enterprises is the logical solution. Such management must be free from autocratic control, whether by capital or by labor.

Sharp social or industrial disputes are no longer private. Society is affected, therefore such cases must be subject to the decision of authorities based upon intrinsic not arbitrary law.

Industry and public utilities must serve the people. There is no room for special privilege of capital or of labor. Strikes, irregular employment, or arbitrary acts of ownership or of management are harmful, not alone to the immediate parties but to society as a whole.

Productivity and public service are absolutely essential.

On account of the peculiarly intimate familiarity of engineers with industrial problems our responsibility is great.

Therefore, we, engineers and members of the American Society of Mechanical Engineers, declare that the following essentials are established by facts and experience, urge all of our members to uphold them, and invite other engineers to cooperate with us in having them unanimously recognized, viz:

Every important enterprise must adopt competent productive management, unbiased by special privilege of capital or of labor, and disputes must be submitted to authorities based upon intrinsic law.

Credit capital represents the productive ability of the community and should be administered with the sole view to the economy of productive power, that is, it should be granted only to those who are able to render valuable service.

Resolution No. 2. That a "Committee on Agencies of Productivity" be established with sub-groupings to study among others these major agencies:

1. Invested savings,
2. Credit capital,
3. Organized labor,
4. Unorganized labor,
5. Employers,
6. Managers,
7. Society as a whole,
8. Economic and productive intelligence service.

Resolution No. 3. WHEREAS: The vital necessity of immediate constructive action in the field of industrial relations is beyond dispute.

AND WHEREAS: Industrial "Society at Large" obviously stands in need of some organ or agency of continuous productive initiative.

AND WHEREAS: A declaration of principles upon which to base constructive action has today been approved by the society in convention assembled.

BE IT RESOLVED: That we, members of the American Society of Mechanical Engineers undertake to formulate a practical program for industrial relations betterment.

AND FURTHER: That this society undertakes to formulate a practical plan of organization to assist in determining what immediate steps can be taken to put industrial relations on a better footing and coordinate and make effective the splendid work now being done by various agencies.

AND FURTHER: That the council of the society be requested to appoint a committee of five members of the American Society of Mechanical Engineers to study and to make effective this program.

A large part of the credit for the successful presentation of the subject and for the adoption of the resolutions belongs to the New York Section of the mechanical engineers' society which was ably represented in the convention by W. W. Macon, president of the New York Section and Frank T. Chapman, member of the Section's executive committee, both of whom are well-known in heating engineering circles. In accordance with the society's action, a committee has been appointed to carry out the program indicated in the resolutions. Mr. Chapman is a member of this committee which also includes several of the most prominent members of the mechanical engineers' society.

This committee has only recently commenced to function, but it is already being looked upon as the nucleus around which the engineering interests of the country will build up their proposed nation-wide co-operative movement.

New Officers of the American Society of Mechanical Engineers.

An attendance of 2116, of whom 1346 were members, was registered at the recent meeting of the American Society of Mechanical Engineers. This is the largest attendance ever recorded by the society.

The new officers of the society are: President, Fred J. Miller; vice-presidents, E. C. Jones, R. H. Fernald and John R. Allen, director of the research bureau of the American Society of Heating and Ventilating Engineers; managers, D. S. Kimball, L. E. Strothman and E. F. Scott; treasurer, William H Wiley.

Professor Allen addressed the Boston section of the society January 22 on the subject of "Research." Professor A. M. Greene, Jr., also spoke on the same subject.

Construction of Covenant to Heat Leased Offices.

In a suit for specific performance of a covenant to heat to a proper warmth for office purposes the freight offices leased to the plaintiff railroad, the covenant being ambiguous, it was held, New York Central R. R. Co. v. Stoneman, (Mass.) 123 N. E. 679, that evidence was admissible to show the conditions and circumstances under which the covenant was made in order to ascertain whether it was intended to obligate for heating during the night as well as the day. The evidence did not justify a ruling that the railroad was not entitled to have the premises heated 24 hours in the day, including Sundays and holidays. Evidence that from the time the railroad entered into possession, the original lessors kept the premises heated continuously 24 hours each day until the defendant mortgagees entered to foreclose their mortgage was held admissible to show the interpretation of the lease by the original parties. Evidence that the defendants, after foreclosing and taking possession, continued to furnish heat without objection until a certain date, and paid for coal furnished by the railroad to heat the building, was held admissible to show the construction defendants, after taking possesion, placed upon the covenant. Aside from this, as the defendants assented in writing to the covenant, they could not avoid its provisions and interpret it differently from the original parties' interpretation.

NATIONAL TRADE EXTENSION BUREAU

Suggestion for Heating Contractor's Show Window.

A unique idea for a show-window display is suggested by the National Trade Extension Bureau and is illustrated in the accompanying photograph. Besides attracting attention to the display itself, the scheme as proposed is designed to familiarize people with the cost of installing a heating plant, as well as to open the way for a study of the different types of heating systems. Those who enter the contest will of necessity get an idea of the size of boiler needed to heat a house as illustrated by the plans. Finally the contest will educate the public on the matter of automatic damper regulation.

It is suggested that in arranging the contest it should be specified that the winner must be a property owner and the regulator must be installed in his home, now or at some future time. If he has no heating plant, the regulator is to be delivered when he buys one.

The circular letter suggestion to be used in connection with the display is as follows:

Dear Sir:

The tables are turned on you. We are coming to you for an estimate on heating and will pay you for your time, if you prove that you are accurate at figures.

Our proposition is this:

In our show window we are displaying a set of house plans for which we have figured the installation of a modern vapor heating plant. We have prepared our estimate on the plant which is the last word in economical heat installation, and have placed our estimate in the sealed envelope. Now it's up to you to estimate the price of this job and turn in the figures to us. If you come nearest to our estimate you will receive a $50 T. E. B. TEMPERATURE REGULATOR FREE.

This is more than a mere guessing contest. Here is a chance to show your skill as an estimator and to accumulate some real knowledge about the best methods of heating a home.

Our estimate is based on furnishing all material and labor needed to complete the job. You can do the same with little effort. Here's hoping you're the successful bidder.

Yours for a well-heated building,

A STEAMFITTER CO.

The Trade Extension Bureau announces that it has been delayed in sending out its directory of heating and plumbing contractors of the United States, but that they would be mailed early in January. Next month some time in January the bureau expected to announce its first national campaign.

Activities of Engineering Council.

Announcement is made that the Engineering Council, which is an organization of the five principal national technical societies of America, created to consider matters of common concern to engineers, has joined the Chamber of Commerce of the United States. Among the projects which are engaging the attention of the Engineering Council are an employment bureau, a movement for increasing the salaries of engineers, and the question of increasing the length of engineering courses in the college from four to six years.

The council has asked the Chamber of Commerce to conduct a referendum on the proposed National Department of Public Works. The license committee of the council has drawn up a draft of a typical law for the registration of engineers. The committee on classification and compensation of engineers is making rapid progress in collecting and digesting data on Federal, railroad, State and municipal engineers.

In connection with fuel conservation, a committee of the council has recommended the support of legislation for investigating super-power generation and distribution in the Boston-Washington district, a proposition that received the approval of the council.

GUESS!
IN THIS ENVELOPE
Is our Estimate on the Cost of Installing this BOILER and the necessary Radiation to heat the house of this plan
THIS Heat Regulator FREE
If not operating on HOT WATER STEAM OR HOT AIR FURNACE
Non-wind MOTOR
Installed complete 75
This Heat Regulator will be given FREE TO THE PROPERTY OWNER

SUGGESTION FOR WINDOW DISPLAY FEATURING CONTEST FOR ESTIMATING COST OF SYSTEM.

Formulation of Standard Safety Codes Under Way Affecting All Industries.

According to an announcement made by the National Safety Council, a definite start will be made within the next month in the formulation of uniform standard safety methods, beginning with those subjects on which rules are now being formulated or revised by State or other authorities. This action is the direct result of the conference called by the Bureau of Standards and held in Washington in December. The work will be under the general auspices of the American Engineering Standards Committee, which was organized a couple of years ago by the five leading engineering societies and three government departments, those of War, Navy and Commerce.

Engineers' Schedule of Salaries.

The following schedule of salaries has been adopted by the American Association of Engineers:

City engineer, annual work, $5000 to $15,000; city engineer, annual work, $2500 to $10,000; city engineer annual work $1,000, to $7500; City engineers annual work, $500 to $5000; department engineer, $7500; division engineer, $7500; assistant engineer, $3600; instrument man (preferably technical graduate), $2400; rodman (high school, 2nd grade), $1500; inspector, $1800; architect, $5000; designing engineer (technical graduate, 10 years' experience), $6000; designer (technical graduate, 5 years' experience), $4400; detailer

(technical graduate preferably), $3000; tracer (technical high school); $1800; draftsman, architectural, $3000; draftsman, map or topographic, $2400; draftsman, structural, $2400.

Review of the Fuel-Oil Situation.

Charles H. Bromley, associate editor of *Power*, asks and answers the following questions in a recent issue of that journal:

What is there to all this talk about fuel oil?

Why is it creating such widespread interest?

Where is it applicable, and under what conditions?

What are its sources and what about the continuity of supply?

Wherein does it surpass coal in the matter of cost and boiler performance?

How does it influence the labor situation in one's power plant?

What problems are connected with its storage and handling?

In the first place, he states, practically all fuel oil used in the furnaces of the United States, excepting in some sections on the Gulf and in California, comes from Mexico, chiefly out of Tampico. Perhaps the best indication of the way the big oil corporations look upon the possibilities in the use of fuel-oil is furnished by the Standard Oil Company of New York, which has purchased a mile of harbor front at East Providence, R. I., the property extending back for three miles. Here it is proposed to erect a great tank farm, making Providence perhaps the largest fuel-oil center in the world. The investment so far represents $18,000,000.

The Mexican Petroleum Corporation, which may be said to be the big pioneer in fuel-oil along the Atlantic Coast, has established large storage stations at Providence, Boston and Portland. Before these were built, stations had already been conveniently located farther south and on the Gulf. This company now has 19 tankers taking oil out of Tampico.

As to the applicability of fuel oil, Mr. Bromley states that it is applicable wherever coal may be burned in furnaces. It may be used in small, as well as in large, power plants.

The price of oil is not paramount, particularly in a plant changing from coal to oil. The cost of equipment for oil, including adequate storage, is a vital factor. But as a fuel, roughly 4½ bbl. (42-gal. barrels) are equivalent to a long ton of good coal, or a pound of oil equals a pound and a half of good coal. But oil, he states, is better than that. That value is based on the relative heat units in coal and oil. Complete combustion means the complete consumption of the combustible in a fuel brought about by the supply of oxygen of the air. Perfect combustion is the use of only as much oxygen as is theoretically required to completely burn the fuel. Fuels must be gasified before they burn and obviously oil, which has no ash, which does not form a fuel bed with clinkers, may more easily be broken up, atomized and gasified than coal.

Because of this mechanical advantage which oil possesses over coal it gives, in the average plant, a greater combined boiler and furnace efficiency of from 6% to 8%, all other conditions being equal. That is, with a given plant, load and labor, the over-all efficiency will be higher for oil by the amounts given. It should be understood, however, that materially no greater combined efficiency is possible with oil than with coal. A first-class fireman, with first-class stoker and coal of good quality, can show practically as good results as one can with oil, but they cannot be maintained for so long.

In connection with the labor situation, Mr. Bromley states that one competent fireman can handle four times as many boilers using oil as he can using coal.

In the matter of storage and handling, the steel storage tank is described as popular, while the large and medium-sized plant often finds concrete desirable.

Regarding the continuity of supply, Mr. Bromley states that nobody knows much about it, although there is every reason to believe there is more oil available in the ground than even the oil companies have hoped.

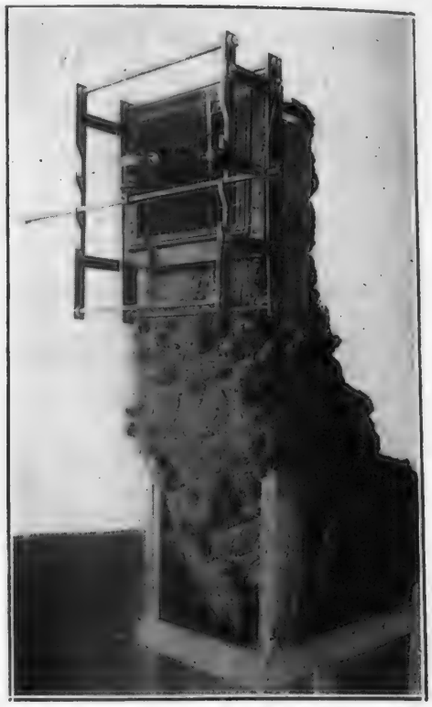
New Publications.

INSTANT CALCULATOR, designed to give instantly the correct selling price on any cost from $10.00 to $10,000, based on a percentage that will insure a fair profit above overhead expense, has been published by the Instant Calculator Co., 607-609 Water St., Baltimore, Md. The table is worked out on the basis of 33⅓% on the selling price, or 50% on cost; also on a basis of 30% on the selling price, or 40% on cost. It is explained that the latter percentage should be used only on larger jobs or where the money involved can be quickly turned over. Emphasis is laid on the fact that a given percentage of selling price is not the same percentage of cost. Failure to realize this is given as the reason why apparent profits may be actually losses. Several examples are included showing how profits may be incorerctly figured, while other examples show the proper way the calculations should be made. The Instant Calculator sells for $1.00.

REPORT OF PROGRESS IN WARM AIR FURNACE RESEARCH (Bulletin 112), being a preliminary report of progress under the present co-operative agreement between the National Warm-Air Heating and Ventilating Association and the University of Illinois for an investigation of warm-air furnaces and furnace heating systems, has been issued by the Engineering Experiment Station of the University of Illinois by Professor A. C. Willard. The principle objects of the investigation are:

(1) To determine the efficiency and capacity of commercial warm-air furnaces under conditions similar to those existing in actual installations with leaders, stacks, and registers to form a complete system.

(2) To determine satisfactory and simple methods for rating fur-



TYPICAL ARRANGEMENT AT REGISTER FACE IN CALIBRATING PLANT FOR MAKING ANEMOMETER TRAVERSE OF WARM AIR REGISTER.

METHOD OF MAKING ANEMOMETER TRAVERSE AT REGISTER FACES ON MAIN WARM AIR FURNACE TESTING PLANT.

naces so that the proper size and type of furnace can be definitely selected for the service required.

(3) To determine methods of increasing efficiency and capacity of furnace heating equipment and the advantages or desirability of certain types of design.

(4) To determine the heat losses in furnace heating systems and the value of insulating materials as affecting the economy of the furnace or the leaders and stacks, and finally of the system as a whole.

(5) To determine the proper sizes and proportions of leaders, stacks, and registers supplying air to first, second, and third floors.

(6) To determine the friction losses in the cold air or recirculating ducts and registers and their proper size, proportions, and arrangements or location.

(7) Eventually, to make a study and comparison of outside and inside air circulation as affecting the economy and operation of furnace systems.

METHOD OF MAKING TRAVERSE AT THE INLET OPENING OF THE CALIBRATING PLANT FOR MEASURING RECIRCULATED AIR.

Copies of Bulletin No. 112 may be had without charge by addressing the Engineering Experiment Station, Urbana, Ill. Size 6x9 in. Pp. 68.

INDUSTRIAL FUELS, by J. Stephenson, is the subject of a timely manual dealing with the latest practice in this field. Fuels are discussed which are especially applicable to the industries and the text is arranged so as to permit immediate comparison to be made for the selection of a fuel for a specific purpose. Following an interesting chapter on the general subject of coal, the author takes up natural gas, coal gas, oil gases, producer gases, coke and fuel briquets, devoted a chapter to each. Under "Application of Commercial Gases," there is a discussion of water heating and steam generation by gas for a number of commercial purposes. Those interested in fuel analysis will find this item well treated, embracing coal, oil and gas. Industrial fuels of the future are described as including domestic garbage which the author states, is attracting much attention at the present time as a source of raw material for the manufacture of artificial fuel. Attention is also directed to the methods followed in the distillation of alcohol and the utilization of various products as a source of alcohol, including potatoes, beets, wheat, corn, rice and other cereals. The book is well illustrated with 107 drawings. Size 6x9 in. Pp. 190. Price $2.35 paper and $3.00 cloth. Published by the Westman Press, Ltd., Toronto, Ont., or may be had through the book department of THE HEATING AND VENTILATING MAGAZINE.

COLLOIDAL FUEL, by Lindell T. Bates, LL. D., secretary of the Submarine Defense Association, supplements in an interesting manner, the discussion of this fuel which was reviewed in THE HEATING AND VENTILATING MAGAZINE for October, 1919. This pamphlet is the advance reprint of a chapter in Bacon and Hamor's "American Fuels," which is to be issued shortly under the auspices of the Mellon Institute of Pittsburgh, Pa. Colloidal fuel is a composite—a liquid, a mobile paste or gel—in which pulverized carbonaceous substance and liquid hydrocarbon are so combined and treated as to form an adequately atomizable fuel. The author refers to previous attempts to make a liquid fuel of pulverized coal with oil of tar with oil. However, as oil does not ordinarily dissolve coal or tar, comparatively rapid and uncontrolled separation, settling out or sedimentation of some of the components, or complication or cost of the combination treatment developed, has heretofore discouraged industrial use of the product. The chemistry of solutions and suspensions is then discussed at length. The efforts of the Germans during the war to cut off the oil supply directed renewed attention to the possibilities of combining coal and oil into a liquid fuel and a number of tests were made, notably on the U. S. S. Gem, under the direction of Mr. Bates, in which Colloidal Fuel was successfully burned. Recognition of rights for this fuel has now been made in the principal countries so that publication of the technical details of the process, including the fixateur which, when added to the composite, holds the solid matter in suspension, may be expected shortly. The pamphlet, however, goes on to describe in a general way the scientific bases of the product and process of Colloidal Fuel, concluding with typical results of steam tests on the U. S. S. Gem and data and results of boiler tests at the Standard Oil Refinery in Brooklyn. In conclusion, it is declared that a new series of fuels has entered the market which will be beneficial both to the oil and to the coal industry. The new colloidal fuel, it is added, is suitable for steam making and power purposes ashore as well as afloat, being adaptable to all oils, to all coals and to all countries.

A "Forced Steam" Circulation and "Closed Loop" Border-Feeding System for Paper Mills.

The difficulty experienced by paper manufacturers in removing water and air from their dryers, thereby preventing the circulation of steam through the dryers and causing uneven drying, has led to the development by the Farnsworth Co. of Conshocken, Pa., of a new system to overcome this difficulty. It comprises the use of steam at a high velocity which is sent through the dryers by means of a "forced steam" circulation system. This not only eliminates all water and air but provides a constant, even, known temperature throughout the dryers at all times, which decreases the pressure necessary to dry the paper and permits the speeding of the machines so as to increase production anywhere from 5% to 10%.

In addition, by means of a "closed loop boiler-feeding system the condensation from the paper machine and all other heating apparatus, and make-up water as well, is held under pressure and returned directly into the boilers at a high temperature, thereby, it is stated, saving from 10% to 30% of the coal. These systems eliminate individual traps on the dryers, vacuum pump, receiving tanks, hot wells, boiler-feed pumps, as well as much piping and maintenance cost.

Fig. 1 shows the systems applied to a paper machine having a basement underneath it. This system is explained as follows:

The paper machine is divided into two sections, one of these sections to have 75% of the dryers and the other section the remaining 25%. The steam and return headers between the two sections are cut, and a steam separator is placed on the end of the return header for the dry end section, which separates the condensation from the steam which has blown out into this portion of the return header. This steam is passed over to supply the steam header for the remaining dryers on the wet end. On the end of the return header for the wet end dryers is placed a duplex condensation pump of the condenser vacuum type. This machine has cold water sprays in the top of the tank. The spray water condenses the vapors in the return line producing a "forced steam" circulation.

In other words exhaust steam enters the dry end of the paper machine and passes through the dryers on the dry end at a high velocity, due to the condensing of the steam in the wet end section, assisted by the vacuum produced by the condensing sprays in the duplex condensation pump on the end of the return line for the wet end section.

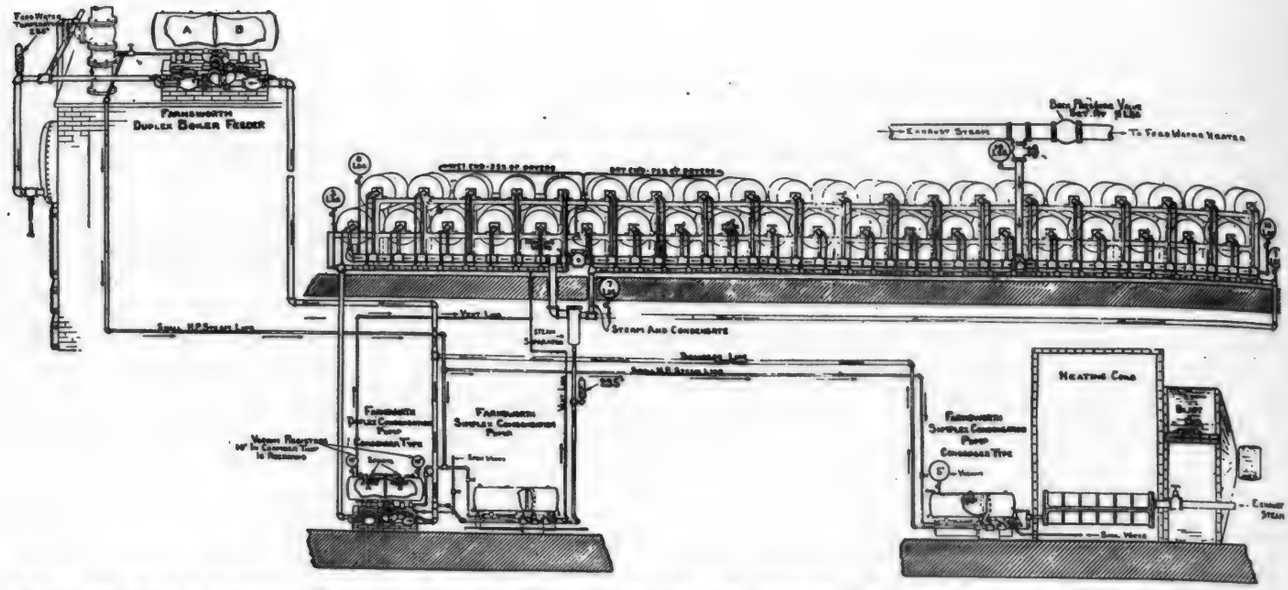


FIG. 1—"FORCED STEAM" CIRCULATION AND "CLOSED LOOP" BOILER FEEDING SYSTEMS APPLIED TO A PAPER MACHINE.

This also produces a high velocity of steam through the wet end section with the result that water and air is eliminated from both sections and a constant, even, known temperature produced at all times. The dryers on the dry end are hottest with a gradual decrease in temperature as the wet end is approached.

If for any reason insufficient steam should pass through the steam separator to maintain the required pressure in the wet end section steam is by-passed through a reducing valve and the proper amount is supplied.

Summing up, therefore, the steam supply line for the paper machine is connected at or near the beginning of the dry end. Steam is allowed to blow through all the dryers in the dry end section and out into the return line, carrying with it all the water and air in these dryers. These dryers are, therefore, nothing more than the steam supply line for the dryers on the wet end.

The condensation is then separated from the steam that has blown through and this steam is passed over to supply the dryers on the wet end section. The condensation that collects in the separator is drained into a simplex condensation pump. The air which enters the receiving chamber of each machine escapes through the vent.

OPERATION OF "CLOSED LOOP" BOILER-FEEDING SYSTEM.

In the "closed loop" boiler-feeding system the condensation, which is collected in the Simplex condensation pump and in the Duplex condensation pump, condenser vacuum type, is pumped automatically during the operation of the machine to the receiving chamber of the Duplex boiler-feeder, located from 3 to 10 ft. above the high-water line of the boilers.

The Duplex boiler feeder has two chambers, one of which is always receiving, while the other is delivering, the condensation with its latent heat directly into the boilers, giving a high feed-water temperature. The Duplex boiler-feeder and the condensation pumps require only one-tenth to one-fourth the amount of steam used ordinarily because in these machines steam is applied directly to the surface of the water instead of behind a piston.

The condensation from all high-pressure traps is discharged directly into the line leading to the receiving chamber of the Duplex boiler-feeder. The condensation from all low-pressure heating systems, fan coils, etc., is drained into Simplex or Duplex condensation pumps and is forced up to the receiving chamber of the Duplex boiler-feeder by the aplication of live steam on the surface of the condensate in the tank while it is in the receiving position.

The "closed loop" boiler-feeding system is described as an efficient method for handling condensation because the pressure is never relieved from the surface, which would lower the temperature to correspond with the decreased pressure.

APPLICATION OF SYSTEM TO A BOARD MILL.

Fig. 2 shows the systems applied to a board mill using live steam in the dry and containing one-third of the total number of dryers; the remainder of the dryers are supplied with exhaust steam. In this case the machines which drain the paper machine are set in pits, there being no basement underneath the paper machine.

Under these conditions the live steam division of the paper machine and the exhaust steam division are each divided as in the case of Fig. 1. That is to say, each division is sub-divided into two sections, one section to have 75% of the dryers, and the remaining section 25%.

With this arrangement live steam blows through the first section on the dry end and out into the return line at a high velocity. It passes through a

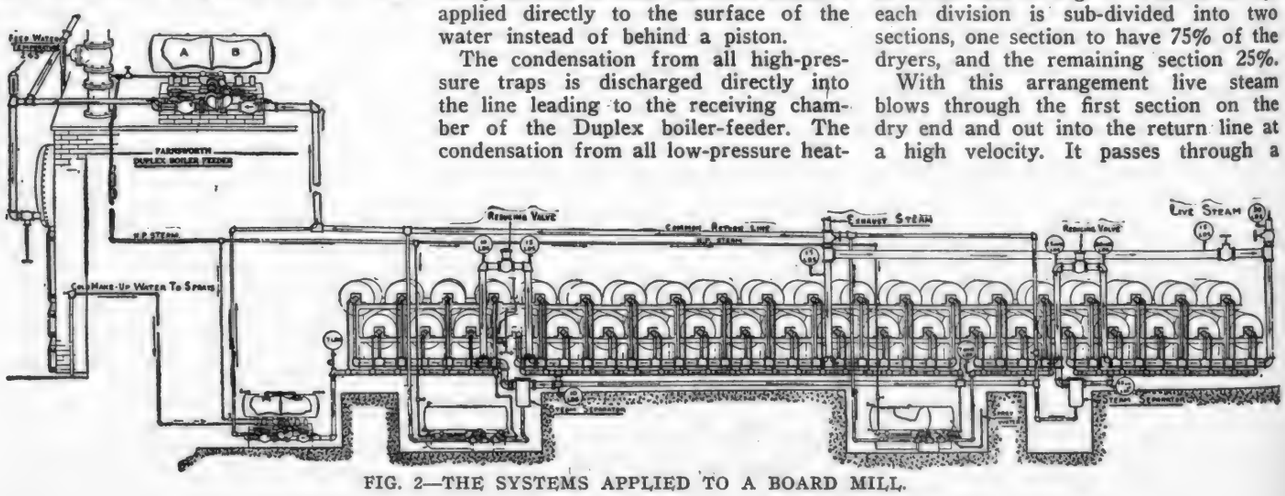


FIG. 2—THE SYSTEMS APPLIED TO A BOARD MILL.

steam separator and over into the second section of the dry end where it is condensed and this condensing effect, assisted by the Simplex condensation pump, condenser vacuum Type, on the end of the return line produces a "forced steam" circulation system through the both sections.

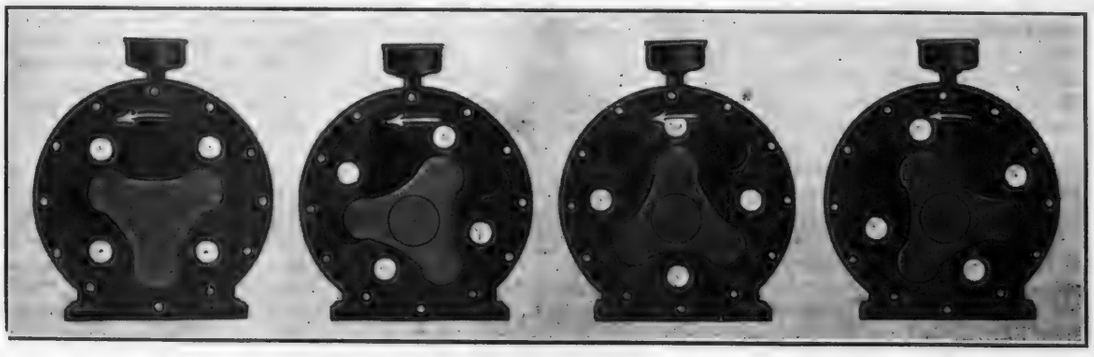
The exhaust steam division of this paper machine is handled exactly as described for Fig. 1.

The dryers on the dry end are hottest with a gradual decrease in temperature as the wet end is approached. The hot dryers on the dry end set the paper as it leaves the paper machine. The condensation, which is drained into the separator on the live steam dryers is forced to the receiving chamber of the Duplex boiler-feeder by the pressure carried on the dryers.

The other three machines pump the condensate to the receiving chamber of the Duplex boiler-feeder and, as previously stated, all the condensation, with its valuable heat units, is delivered directly into the boilers.

New Form of Rotary Pump or Blower.

A pump or blower of novel construction has been designed by E. Fenerheerd, of Bath, England, and was a feature at the annual show of the Royal Agricultural Society of England, where it was exhibited by Fielding & Platt, Ltd., of Gloucester. The four rotative positions of the pump are shown in the accompanying illustrations, which is reproduced from the *Compressed Air Magazine*, having originally appeared in *The Engineer*, London.



NEW FORM OF ROTARY PUMP OR BLOWER

The four-pocketed ring which fits easily in the circular case, and the rotating triangular impeller are enclosed within the plates which form the covers of the case. It will be noticed that the driving shaft which carries the impeller is located below the center of the case. The inlet and discharge openings are located in either or both of the covers, extending but little above the center line. With the rotation as indicated by the arrows the discharge would be on the left side and the intake on the right.

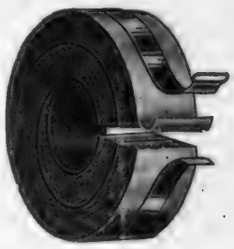
As there are no valves or other parts to wear or get out of order this should be a very satisfactory pump for water and a quite effective blower.

Trade Literature.

"F. AND K" HOT BLAST HEATER, manufactured by the "F. and K." Products Co., Cleveland, O., has a new feature which is described in recent circular matter issued by this company. Under the new form of construction it is possible to obtain the same principle of air circulation as is embodied in the pipe coil heater. In addition, the internal construction of the "F. and K." heater, it is stated, eliminates all possibility of air binding or short-circuiting of steam, making every square foot of heating surface effective. The circular shows a typical 40-in. section.

ECONOMY MANUAL B, devoted to the application of Economy automatic and continuous-operating electric power-driven pumping machinery, for use in connection with heating, ventilating and building service, has been prepared for the special convenience of estimators. The apparatus described is accompanied with numerous illustrations of typical installations. There are also several pages of valuable engineering data bearing directly on this line of work. The manual is published by the Economy Pumping Machinery Co., Chicago, Ill. The apparatus described includes the Economy automatic condensation pump and receiver, Economy automatic underground pump and receiver, types of Economy vacuum, boiler-feed, vacuum and pressure pumps; air eliminators, air line pumps, strainers, automatic electric regulators for pressure or vacuum; circulating pumps and sewage and bilge pumps. This is followed by "Standards of Computation" for radiator quantities, adopted by the Chicago Master Steam Fitters' Association last May. Size 3/3 x 6 1/4 in. Pp. 34.

NATIONAL NEVER-FREEZE INSULATION, called to the attention of the trade as an effective covering for water pipes to prevent freezing, is the subject of a circular issued by the National Asbestos Mfg. Co., Jersey City, N. J. This insulation consists of two layers of 3/4-in. thick hair felt with a tarred felt lining and a tarred felt outside backing, and canvas jacketed. The insulation is very flexible, making it easy to apply to bent portions of piping. The price



NEVER-FREEZE INSULATION.

list accompanying the circular shows that it is made for eight sizes of pipe, from 1/2-in. to 3-in.

SHOPS, including a few of those which Westinghouse, Church, Kerr & Co., of New York, have designed and built, are illustrated in a blanket circular issued by this firm. A shop, it is explained, is primarily a layout of equipment housed in a suitable building. In the design and construction of any shop this firm, which describes itself as a purely engineering organization with nothing to sell but service, first makes an ideal equipment layout, co-operating with the client in working out routine and handling problems. The design and construction of the buildings then proceeds over and around the equipment. This method of meeting specific requirements by building over and around a layout, it is stated, is fundamental with Westinghouse, Church, Kerr & Company on all of their work. One of the company's most notable undertakings, included in the illustrations, is the plant of the Westinghouse Electric & Mfg. Co., at Essington, Pa.

PITOT TUBES AND ORIFICES for measuring the flow of gases in connection with Hydro flow meters, and Bacharach "Easy Read" pressure volume indicators, for the control of air delivery to cupolas, are the titles of two interesting bulletins (Pamphlet P and Catalogue F, respectively) recently issued by the Bacharach Industrial Instrument Co., Pittsburgh, Pa. The pamphlet on Pitot tubes and orifices summaries the company's extended experience in this field. The various types of Pitot tubes used are described in detail, followed by a discussion of the use of standard and tin-plate

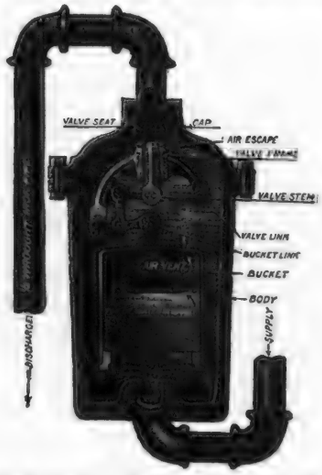
orifices. The Hydro recorder is also shown, being designed to measure the differential pressure which, it is explained, is proportional to the square of the velocity of the gas flowing. The bulletin includes views of two typical installations of Pitot tubes and orifices in combination with a Hydro recorder. Size 6 x 9 in. Pp. 8.

CLEVELAND RESISTANCE PYROMETERS for indicating temperatures in schools, hospitals, apartments, chemical plants, oil refineries, refrigeration plants, greenhouses and similar installations, described as unusually simple and accurate, are the subject of a catalogue published by the Cleveland Instrument Co., Cleveland, O. They have been developed especially to meet the need for an instrument to measure temperatures above and below, as well as within the range of, the mercury thermometer. The Cleveland resistance pyrometer is described as highly practical and entirely suitable for commercial purposes, as all the temperature readings of various industrial processes may be observed quickly or permanently recorded, at a central point, which may be any distance from the source of heat. The instrument consists essentially of a coil of wire in which the electric resistance varies consistently with changes in temperature, and instruments for accurately measuring the variation in resistance. Of the two methods in use for measuring this change in resistance of the resistance coil, or "pyro," the Cleveland method is described as much simpler in operation. Both involve the Wheatstone bridge or a modification, and may give the readings in ohms, or directly in temperature. If the reading is in ohms, a conversion table is supplied. In the method used with this instrument, one adjustment only is necessary and this is needed only once for a number of readings. The galvanometer is graduated in degrees, and by pressing a button corresponding to the station desired, the pointer indicates directly the temperature at the required point. This is done by utilizing the fact that, with a certain fixed battery current flowing through the Wheatstone bridge circuit, the same deflection of the galvanometer will always be produced by the same resistance value of the pyro. The different deflections caused by the different resistance values of the pyro are plotted by hand and drawn in on the galvanometer scale, thus insuring equally accurate results with each individual galvanometer. Since the battery current must remain constant, adjustment is provided to make up for the drop which naturally occurs as the battery is used. This adjustment is usually necessary about once every 24 hours, with average use. The operating principle of the Cleveland resistance pyrometer is described at length in the catalogue, being followed by illustrations and descriptions of the Uni-Pivot suspension type, together with the cabinets, meters and switchboards furnished. Size 8 1/2 x 11 in. (standard). Pp. 8.

CLEVELAND RESISTANCE PYROMETERS.

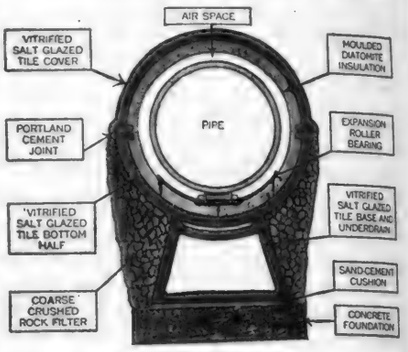
NELSON VALVES, covering the extensive lone line of bronze, iron and steel valves, made by the Nelson Valve Co., Chestnut Hill, Philadelphia, Pa., are the subject of a new catalogue issued by this company. The various patterns include gate, globe, check and non-return, and embrace types for practically every class of service found in power plant work, industrial establishments and large building construction. The catalogue is sub-divided into three principal divisions of bronze, iron and steel construction. Size 5 x 7 1/2 in. Pp. 156.

ARMSTRONG STEAM TRAP, described as "the trap with the different principle," is described in newly-issued circular matter published by the Armstrong Machine Works, Three Rivers, Mich. In this trap, the bucket is inverted and submerged and the inlet is in the center of the bottom of the trap. Water (and and oil with it) enters, flows up and around the bucket and out through the open valve. Steam is caught in the bucket, displacing the water and causing it to float and close the valve. Any air entering the bucket leaks out through a vent in the top and collects at the top of the trap whereupon the bucket sinks again and opens the valve, freeing the air with the discharge. Steam must pass through the water to reach the valve so that it is condensed in that way. The mechanical construction of the trap is designed to make air binding impossible. The trap is also described as self-scrubbing and is of unusual capacity. Special types designed for pulsating pressure are illustrated in the circular.



CONSTRUCTION OF ARMSTRONG STEAM TRAP.

RIC-WIL SECTIONAL, VITRIFIED TILE CONDUIT, CLASS DA INSULATION, for hot water supply and return pipes placed underground for heating systems, as well as for low-pressure steam pipes or combinations of steam and water pipes and oil distributing systems, is the subject of a new series of bulletins (No. 1), issued by the Ric-Wil Co., Cleveland, O. They are punched for permanent filing. The important data regarding this conduit is concisely presented, accompanied by detail views of the construction used, as well as details of typical installations. The insulating material, which is moulded to the inside of the tile jacket, is a mixture of diatomaceous earth which aroused so much interest when it first came into use, due to its cellular construction, making it probably the most effective inorganic thermal insulator known. The water-proof jacket of the Ric-Wil conduit is made from Akron shale, dried and vitrified and salt-glazed inside and out. The conduit is made for a wide variety of applications which are referred to in the bulletin. Size 8 x 10 3/4 in. Pp. 8.



CROSS SECTION OF RIC-WIL CONDUIT, SHOWING PRINCIPLE OF CONSTRUCTION.

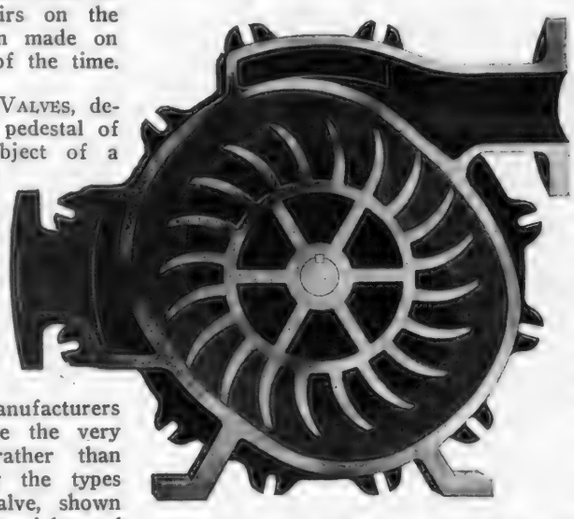
A DANCE, A FAN AND THE GIRL, is the title of a cleverly-compiled little story issued by the Clarage Fan Co., Kalamazoo, Mich., said to be based on fact. It deals with the experinece of a young assistant superintendent who missed a dance at the last moment through the burning out of the bearings of a cupola blower at his plant. The sequel came a few years later when, as general manager of the plant, he was called into the machine shop to look at a new blower which had just arrived. The fan in question was a No. 60 Clarage Style C blower, Arr. B, and as it stood it was a right hand, bottom, horizontal discharge. The superintendent had ordered a right-hand top horizontal discharge. The keen eye of the general manager then discovered that to make the fan a top horizontal discharge it was only necessary to remove the tap bolts and swing the housing to the desired position. Then before replacing the tap bolts, the journal, side-plate, arm, shaft, pulley bearings, and wheel could all be withdrawn in one piece and replaced from the other side of the housing. The inlet casting could then be bolted back on the side where the journal side-plate then stood and the transformation would be com-

plete. This feature, together with the mechanical details of construction, including felt washers at each end of the outer case to make it dust-proof and oil-tight, inner sleeves split and therefore easy to remove without disturbing the shaft, extra large oil reservoirs, double oil rings, ball and socket joint, self-aligning and self-adjusting, all brought home the fact that if the plant had been using such fans at the time of the dance there would have been no disappointment, as the repairs on the old blower could have been made on the new fan in a fraction of the time.

DOLE PACKLESS RADIATOR VALVES, described as "supreme on the pedestal of public esteem," are the subject of a readable catalogue issued by the Dole Valve Co., Chicago, Ill. Emphasis is laid on the point that the materials used in these valves, together with the principle of construction, have been matters of the greatest care as the company takes pride in classifying itself among the manufacturers whose ambition is to make the very best product obtainable, rather than competition goods. Among the types illustrated are the angle valve, shown in sectional form; the Dole right and valve; the wood wheel straight-way gate left-hand corner valve; the lock-shield valve; the wood wheel angle gate valve; the Dole graduated valve, the graduated lock shield valve. Roughing-in dimensions are included for each valve. The Dole graduated valve is made in six sizes, from 1/2-in. to 2-in. The accompanying illustration shows the construction of this type which turns on ball bearings. If any adjustment is desired after the valve is fitted and installed, this may be done by loosening the octagon nut on top of the dial with a special wrench which is furnished for the purpose, turn the dial to the left to the desired point, and then tighten nut. Size 3 3/4-in. x 8 1/8-in. Pp. 20.

DOLE GRADUATED VALVE.

NASH HYTOR COMPRESSORS for air and gas and Nash Hytor vacuum pumps for air or gas, are presented in two new bulletins (Nos. 10 and 11, respectively) issued by the Nash Engineering Co., South Norwalk, Conn. The compressors described in the bulletin have been built for over eight years by this company and sold under the name "Nash Hydroturbine." The registered name "Hytor" has now been adopted to describe the company's exclusive products. The principle of operation of both the compressors and the vacuum pumps is the same, a rotor being used in each case which revolves freely in an elliptical casing filled with a liquid, usually water. This rotor is a casting, consisting of a series of chambers or spaces arranged around a cylindrical hub. The bulletins explain the action of the rotor in detail, as well as the other parts and operating features, including capacity tables. Sizes of each bulletin 8 x 10 3/4 in. Pp. 8.

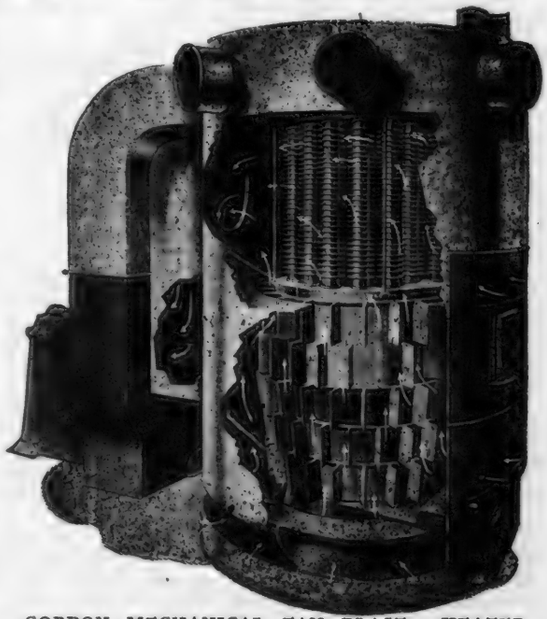


CONSTRUCTION OF NASH HYTOR COMPRESSOR AND VACUUM PUMP.

SIROCCO SERVICE for January, 1920, the periodical of the American Blower Co., Detroit, Mich., contains an illustrated description of the air conditioning installation in the new "Daylight Factory" of the Cox Confectionery Co., in East Boston, Mass. Another article in this number describes the Peter Smith surface car heaters which operate with Sirocco fans. F. R. Still, vice-president and secretary of the company, in charge of Service, writes interestingly of "Sirocco Service as it Affects the Customer." "In every competitive industry," he says, "there is a certain gravitation downward to an unprofitable level. There is only one force which can overcome it and that is service. It is our intention and desire," he adds, "to give the user of 'ABC' and 'Sirocco' products the high type of service which he has a right to expect."

MECHANICAL HOT BLAST HEATER, designed for heating large or small buildings, foundries of all sizes, factories, garages, temporary buildings, schools, concrete buildings under construction when temporary or partial heating is desired, is a unique type of apparatus described in a catalogue issued by the manufacturer, Robert Gordon, Inc., Chicago, Ill. As will be seen from the accompanying illustration, a portable fan is connected with the heater and it is stated that temperatures up to 1200° F. are easily obtained, when desired. The incoming cold air passes through a series of heat chambers and staggered tubes, converting this cold air of any degree into a continuous hot blast of from 80° F. up, as desired. The warmed air is then distributed by means of a multivane blower through the various outlets of the distribution chamber into the building. The cost of the complete installation, it is stated, is about one-third to one-sixth that of either the direct or indirect system of heating of the same capacity. The cost of operation is also said to be low. By staggering the fins and tubes, together with the proper location and design of baffle plates, the air is broken up, permitting it to absorb a greater number of heat units than with a smooth radiating surface. The circular gives details of construction, the grates, for instance, being of the revolving shell-bar type, with three wearing or burning surfaces. The heater will burn hard or soft coal or coke and the manufacturer is now experimenting with oil and gas burners. The heater is built with an interior and fronts entirely of heavy cast-iron, with galvanized sheet metal casing. The radiator and smoke chamber are shipped completely assembled, the other parts being shipped knocked down. Two sizes are furnished, one equalling 7000 sq. ft. and the other 10,000 sq. ft. of direct steam radiation. Size 6 x 9 in. Pp. 8.

BAYLEY CHINOOK HEATERS, including a description of their construction, opera-



GORDON MECHANICAL FAN BLAST HEATER.

tion and application, with illustrations of typical installations and tables, diagrams and methods of calculation, are the subject of a new catalogue, (Bulletin No. 18) published by the Bayley Mfg. Co., Milwaukee, Wis. As an engineering manual the bulletin will be welcomed by all heating and ventilating engineers who desire accurate data on performance and construction. Section 1 tells about the construction, operation and industrial applications of a type of indirect heater which is described as distinctly original and of superior efficiency. Section 2 contains carefully-compiled tables and rules for rapidly and accurately working out the mechanical problems encountered in the planning and installation of indirect heating systems. Typical installations, covering a wide variety of conditions and classes of buildings, are shown by means of plans and diagrams. The bulletin is easily one of the most useful books of ready reference on the subject that has been issued in some time and emphasizes again how much information the fan manufacturers are able to furnish to the designing engineer. The Chinook heater itself is designed on a basic principle so that but one type is necessary, all variations in actual installations being matters of size and position, and not of construction. All pipes of each heater are of precisely the same length and built in precisely the same way. Consequently, the travel of steam in any one of them is identical with the travel in the others. The advantage of this arrangement is in the elimination of short-circuits and of opposing counter-currents. The catalogue also describes the Bayley Plexiform fan used with Chinook heaters, its principal features being its large and practically unobstructed inlet, and the short overhang of the blast wheel. Size 7½ x 11 in. Pp. 80.

Exposition of United States Manufactures in Buenos Aires.

Details received of the forthcoming national exposition of United States manufactures in Buenos Aires, Argentine Republic, show that it will be on an extensive scale, with some 15 different exhibit buildings, covering 36 acres. The exposition, which is scheduled for November of this year, is purely an American enterprise. The United States offices of the exposition are in the Bush Terminal Building, 132 West 42nd Street, New York. The prospectus points out that "dead" exhibits are not desired. The exposition is designed to sell goods. Therefore, every exhibit must be in charge of someone, fully authorizd to take orders and close contracts.

Deaths.

FRANK J. HAYES, President of Hayes Bros., Inc., heating and plumbing contractors, Indianapolis, Ind., who died recently, was one of the founders of Hayes Bros., which was established over 20 years ago. It grew, under his management, to be one of the most prominent firms of its kind in the middle west. Mr. Hayes was 51 years old.

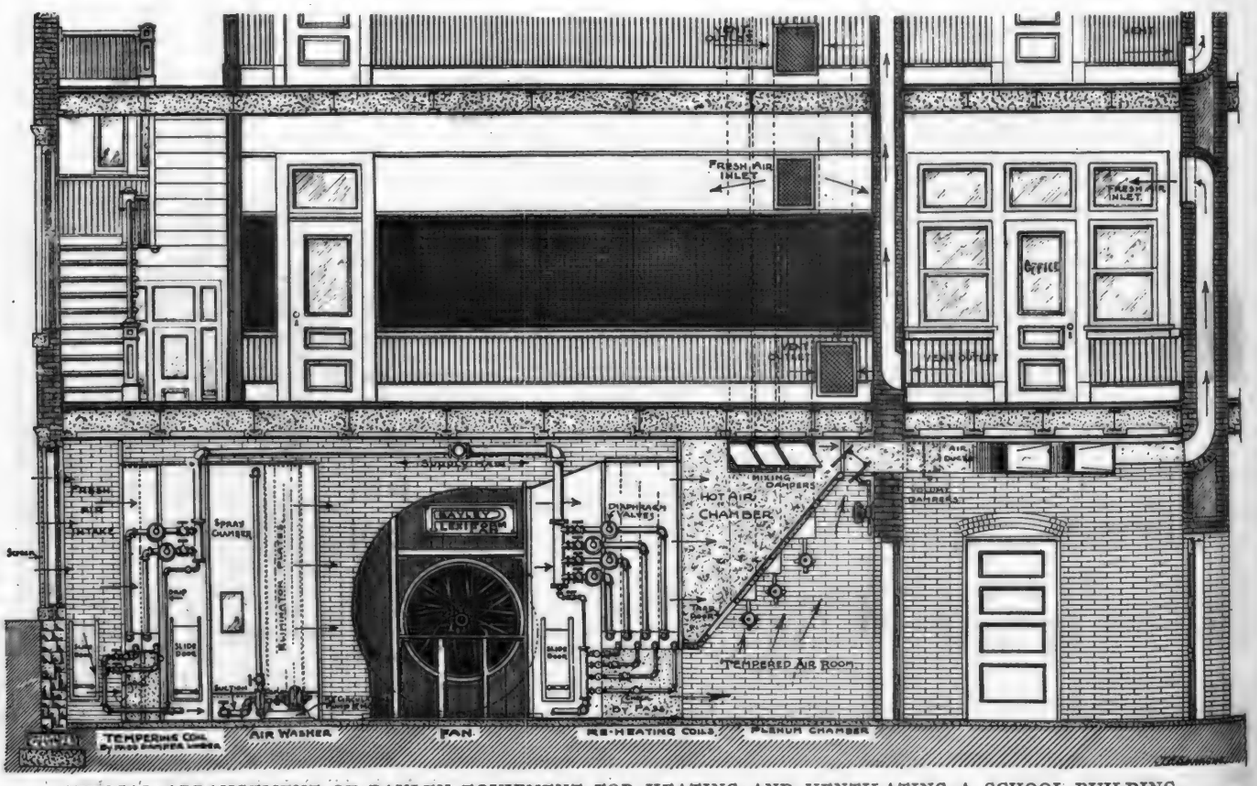
DOUGLAS A. BROWN, shorthand reporter at several conventions of the National District Heating Association, died at his home in Cincinnati, O., November 12, 1919. Mr. Brown had the reputation of being one of the most skillful shorthand reporters in the country and his services were greatly in demand for both convention and court work. He was a conscientious worker and was held in high regard by a host of friends among convention goers.

WILLIAM T. ENGLISH, a well-known heating contractor of Boston, Mass., died December 26 at his home in Hyde Park. Mr. English was a prominent member of the Heating and Piping Contractors' National Association and at the time of his death was chairman of the association's Committee on Standardization. Mr. English was born in Baltimore in 1855. He was for many years construction engineer for the Walworth Construction Supply Co., and later became president of the Walworth-English-Fleet Co. He had recently formed the W. T. English Co.

WANTED

Wanted.—A competent senior draftsman, also junior draftsman for heating and ventilating plan work. Address, with particulars, Box 30, care of HEATING AND VENTIATING MAGAZINE.

Draftsmen—Several draftsmen wanted for heating and ventilating and power layouts of industrial plants. Lockwood, Greene & Co., 101 Park Ave., New York.



TYPICAL ARRANGEMENT OF BAYLEY EQUIPMENT FOR HEATING AND VENTILATING A SCHOOL BUILDING.

For Permanent Cleaning Equipment

use the

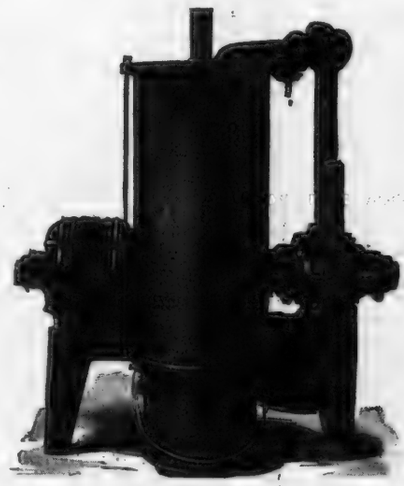
ARCO WAND Vacuum Cleaner!

How a Building is Piped

Showing ARCO WAND Vacuum Cleaner with suction pipe having covered openings or inlets for hose connection in basement, first, and second floors. A strong suction swiftly and silently draws all dirt, fuzzy dust, paper bits, thread, lint, cobwebs, moths, bugs, germs, trash, etc., through the cleaning tool, hose, and pipe down into the sealed dust-bucket at bottom of machine. Above shows "Single Sweeper" ARCO WAND; also made as two sweeper for large buildings.

With the ARCO WAND you can meet cleaning requirements for the *smallest* residence or the *largest* business block. Factories, warehouses, apartments, theatres, churches, clubs, hotels—either new or remodeled buildings. Also made in truck type for cleaning large structures without piping.

Send for catalogs. We will be glad to co-operate in arranging for ARCO WAND Vacuum Cleaners for buildings of any kind or size



This cut illustrates type Numbers 341 and 361 ARCO WAND with electric motor direct drive

AMERICAN RADIATOR COMPANY

Sales branches and showrooms in all the large cities

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

VAPOR HEATING.

The Webster System.

The layout of a typical Webster modulation system is illustrated in Fig. 1. Steam is fed to the radiator at the top in the customary manner while the returns pass out of the radiator through a trap, and return to the boiler through a check valve, the air being relieved on the way by means of the Webster modulation vent trap.

The supply to the radiator is controlled by means of the Webster modulation valve which is produced with six different styles of handles although the No. 10 handle (illustrated in Fig. 2) may be considered as the standard, owing to its greater popularity. This valve is constructed as shown in the cross-section, Fig. 2, and controls the flow of vapor into the radiator by lifting a valve cylinder with a diagonal cut past the valve seat so as to increase and diminish the orifice.

On the return end of the radiator a positive trap is used, this being

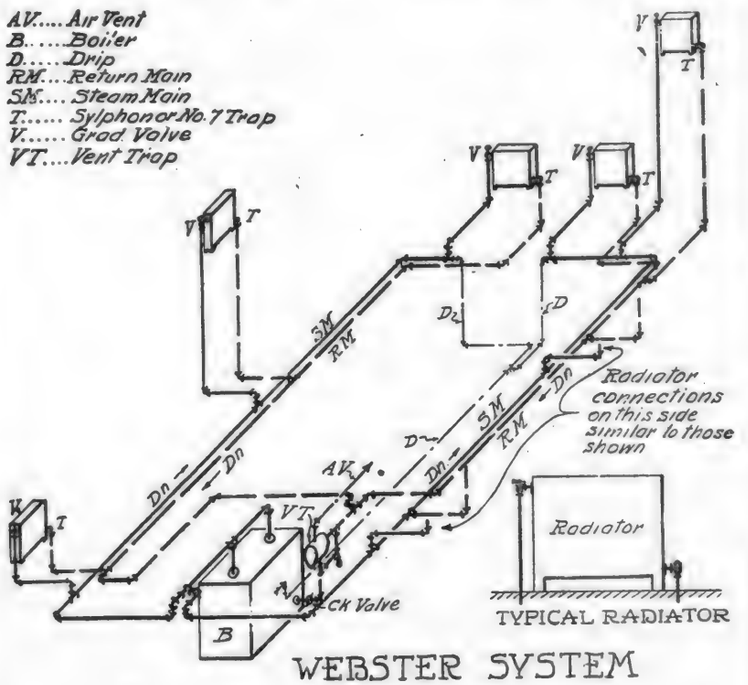


FIG. 1.

preferably the "Sylphon" trap, a thermostatic trap with the expansion member formed by a sylphon bellows made of seamless tubing with twelve corrugations. A cross-section of this trap is shown in Fig. 3. Owing to its thermostatic operation it will pass cooled condensation or air but closes when hot steam strikes the bellows.

Another slightly cheaper type of trap which is sometimes used by the same organization is known as the No. 7 trap. This second type of trap is of the multi-diaphragm type and its operation is similar to that of other disc traps already described.

Water radiators are used and the claim is made that this system of vapor heating can do everything which can be done with hot water and a few things which with hot water are impossible.

The piping system is designed so as to secure the circulation of the vapor with a very small drop,—usually not over 2 oz. per 100 ft. of run or its equivalent. The

(*Continued on Data Sheet No.* 132-J)

VAPOR HEATING—The Webster System. No. 132-I.

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

VAPOR HEATING.

The Webster System.

(Concluded from Data Sheet No. 132-I.)

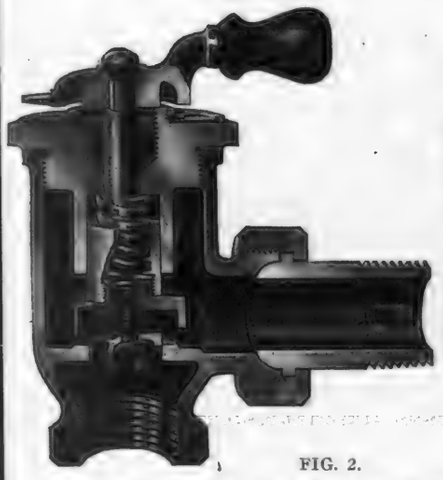


FIG. 2.

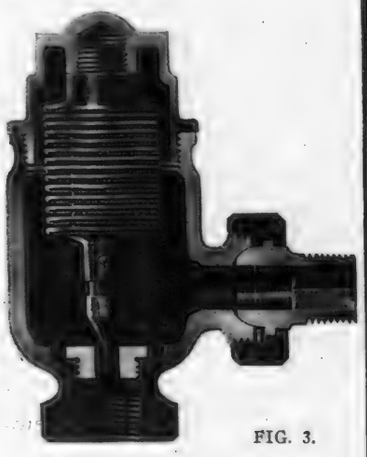


FIG. 3.

ends of the steam mains are dripped into a wet return, which is carried back to the boiler without passing through a check valve. The radiator returns, owing to their carrying air are run back as dry returns to the point where the vent trap is located, and bypass around the trap, entering the boiler through a check valve as shown in Fig. 1. The vent trap, which is illustrated in Fig. 4, operates to relieve the system of air. The air pressure as it accumulates causes the water line in the trap to lower which in turn allows the float to fall, thus opening the valve on the air vent pipe.

The last important item of success in this system is not in any way connected with the piping but is installed directly on the boiler, being the damper regulator. As can be seen in the cross-section view, shown in Fig. 5, this device consists of a lower chamber partially filled with water. From the bottom of this chamber a small pipe is carried up and connected to the lower space below the diaphragm so that any pressure exerted on the surface of the water in the lower chamber will result in driving the water out through the pipe and up into the upper chamber where it exerts an upward pressure on the diaphragm and thus operates the dampers. A steam pipe from the steam main is connected into the regulator just above the water level in the lower chamber and any increase in steam pressure at once begins to drive out the water and thus operates the diaphragm which controls the drafts.

FIG. 4.

FIG. 5.

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

RULES FOR FINDING SPEED AND SIZE OF PULLEYS.

To find the size of driving pulley, multiply the diameter of driven by revolutions it should make, and divide the product by revolutions of driver.

Example 1: Diameter of driven pulley 12 in., revolutions, 240; revolutions of driver, 160; then $12 \times 240 = 2{,}880 \div 160 = 18$, diameter of driver wanted.

To find the size of driven pulley, multiply diameter of driver by its revolutions, and divide the product by revolutions of driven.

Example 2: Diameter of driver pulley, 18; revolutions, 160; revolutions of driven, 240, then $18 \times 160 = 2{,}880 \div 240 = 12$, diameter of driven wanted.

To find the number of revolutions of driven pulley, multiply diameter of driver by its revolutions, and divide product by diameter of driven.

Example 3: Diameter of driver pulley, 18 in.; revolutions, 160; diameter of driven, 12 in.; then, $18 \times 160 = 2{,}880 \div 12 = 240$, revolutions of driven wanted.

To find the horse-power of a driving pulley, multiply the circumference of pulley by the revolutions, and this product by width of belt, and divide final product by 600.

Example 4: Circumference of pulley, 56.55 in.; revolutions, 160; width of belt, 6 in.; then $56.55 \times 160 = 9048 \times 6 = 54{,}288 \div 600 = 9.04$, horse-power ot pulley wanted.

The above rules assume that the driving and driven pulleys are of equal diameter and the contact of belt half the circumference. If pulleys are of different diameter and contact of belt is less than half of circumference; then the rules must be modified as per tables of areas of contact (See Standard Data Sheet No. 168-C).

DRIVES, BELT—Rules for Calculating Pulleys. No. 168-F.

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

CHEMISTRY LABORATORIES.

One of the hardest places to ventilate is the chemistry laboratory and probably more money has been spent in unsuccessful efforts in this line than in any other one direction. In the first place, chemistry ventilation is a most important and essential item and in the second place the persons delving into its mysteries usually belong to a well-educated and more or less scientific class who know and appreciate the requirements of good ventilation.

Chemistry ventilation may well be divided into two parts (a) the room itself and (b) the hoods or cases where the experiments are made. In the ordinary use of the room no unusual feature is encountered and its air supply for this purpose may be based on six to eight air changes or 30 cu. ft. per person.

To remove the fumes from the glass cases in which the experiments are sometimes made is a more difficult proposition. The case door may be up one inch, one foot or four feet; the fumes may be lighter than the air and rise rapidly or they may be heavier than air and roll over the front of the counter and out into the room past the experimenter.

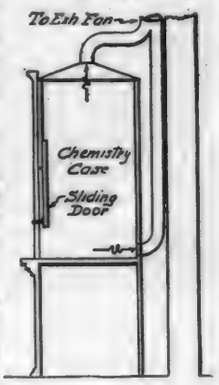


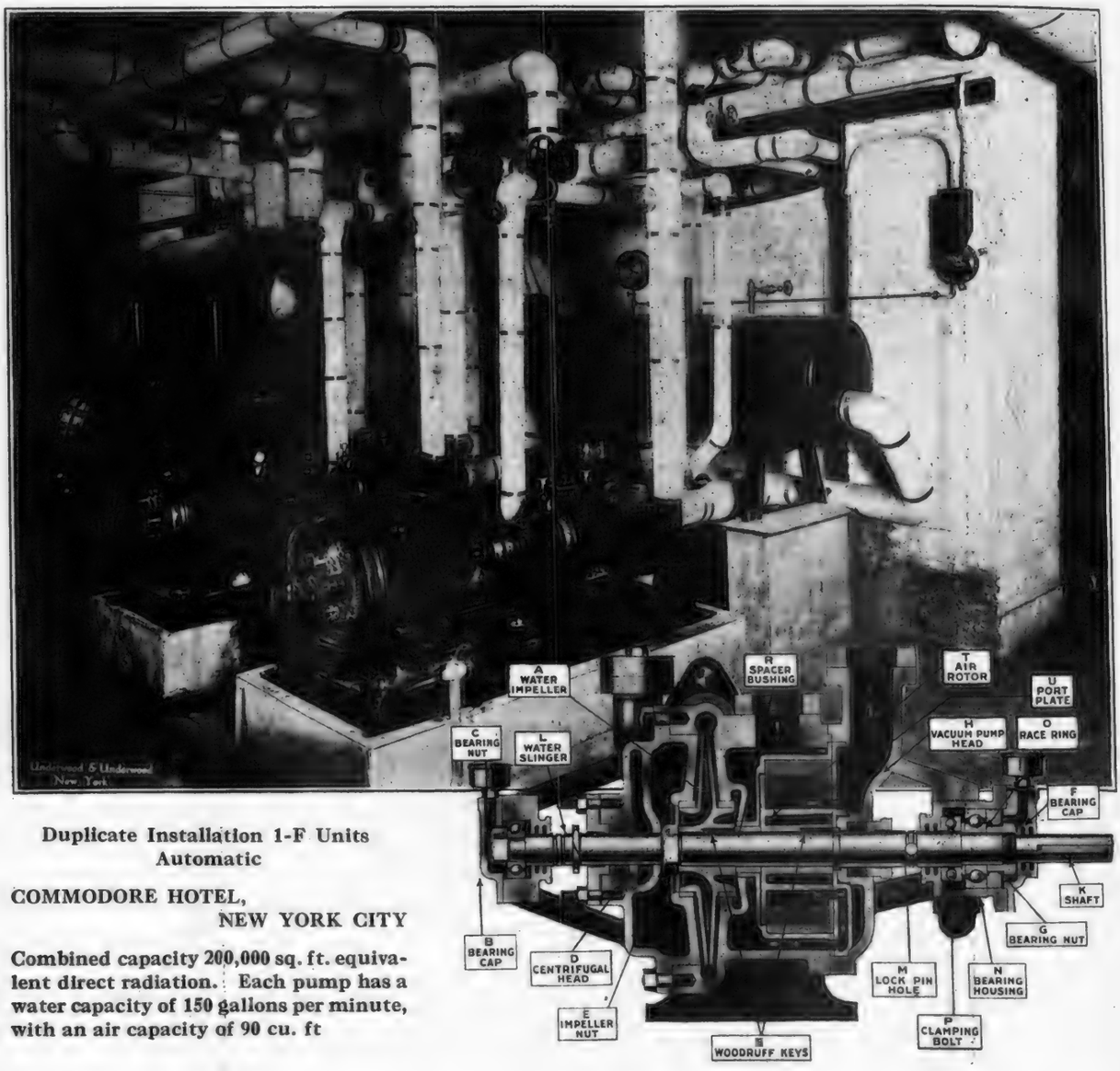
FIG. 1.

Cases used for such work are ordinarily 24-in. wide, 24-in. deep and about 60-in. high; on the top of the case a 24-in. x 24-in. hood is placed, usually with a 3-in. diameter pipe through which the air is exhausted from the case. According to the manufacturers, the air should be exhausted "two or three times a minute" from such hoods which makes the quantity of air 40 to 60 c. f. m. per case. This is not enough and may well be doubled. Even then, unless a pipe is run down to the counter level, as shown in Fig. 1, to catch the heavy fumes the results will be less than desired.

For the little individual hoods supported on goose necks for each pupil, these are exceedingly hard to do anything with owing to the large number usually installed where they are used. It is usual to allow 20 c. f. m. per hood and 1 1/8-in. static pressure for the exhaust fan. It is impossible to secure good results with the individual hood systems, due to the fact that the gases heavier than air are not caught.

No chemical exhaust should have steel or iron pipe owing to the corrosive action of the fumes; copper pipe is used with some success, but tile pipe is much better. The exhaust fan should have a cast-iron case painted with asphaltum and a monel metal impeller and shaft. The supply air should be increased until it is about 80% of the amount exhausted.

EFFICIENT HEATING *demands the* Jennings Pump



Duplicate Installation 1-F Units Automatic

COMMODORE HOTEL, NEW YORK CITY

Combined capacity 200,000 sq. ft. equivalent direct radiation. Each pump has a water capacity of 150 gallons per minute, with an air capacity of 90 cu. ft

THE Jennings Pump consists of two independent turbine units, an air pump and a water pump As each material is handled separately, the boiler pressure is against the water only. The air and vapor, approximately, four-fifths of the volume handled, are delivered to atmosphere without back pressure. The saving in horse power is over fifty per cent.

Because of its compact design, this equipment can be installed in less than one-third the space necessary with other apparatus. All interior parts are bronze, supported on annular ball bearings mounted outside of casing. Moving parts revolve without contact.

There are many other reasons why the Jennings is being installed on practically all of the big jobs. Bulletin No. 8 gives them in detail. Write for it.

NASH ENGINEERING COMPANY

SO. NORWALK, CONN., U. S. A.

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

TRADE AND MISCELLANEOUS NOTES

Miscellaneous Notes.

CHICAGO, ILL.—A tour of inspection of public telephone booths was made recently by Alderman John O. Kostner, with members of a sub-committee of the council health committee, to decide upon the form of an ordinance requiring their ventilation by the telephone company.

NATIONAL PIPE AND SUPPLIES Association will hold its eleventh annual meeting in Chicago, May 10 and 11. Headquarters will be at the Congress Hotel.

NATIONAL FEDERATION OF CONSTRUCTION INDUSTRIES will hold its first annual meeting in Chicago, March 24 and 25, with headquarters at the Hotel Sherman. Among the subjects to be discussed at the meeting are: Standardization in the construction industry; financial relations, dealing with the adequate financing of construction operations, including the question of Federal home loans, and the exemption from taxation of certain of the income from mortgages on real estate, etc.; also jurisdictional awards, housing and Americanization.

CHICAGO, ILL.—The anti-smoke crusade is being vigorously waged in Chicago by Health Commissioner Robertson. For a time during the coal shortage inferior grades of coal were tolerated, but now that the crisis has passed the restrictions are again being vigorously applied.

COLUMBUS HEATING & VENTILATION Co., Columbus, O., is planning a 100 x 120 ft. addition to its plant.

C. J. GEYER, 198 De Ruyterstraat, Sloterdyk, Amsterdam, Holland, secretary of the Society of Iron Dealers of that country, would like to be brought into contact with American houses dealing in all articles made of iron and steel, and building materials. Holland is one of the few European countries which still has the money to buy what it needs, but it cannot satisfy its wants in the old markets.

NATIONAL ASSOCIATION OF MASTER PLUMBERS has announced the dates for its next annual convention. The association will meet in Pittsburgh, June 15-17. In connection with the convention there will be the usual exhibit of heating and plumbing supplies. Pittsburgh is chairman of the committee in charge of the exhibits.

CENTRAL SUPPLY ASSOCIATION will hold its winter meeting in Chicago, February 18, with headquarters at the Congress Hotel. Among the important matters up for discussion is the problem of supply and demand of heating and plumbing materials for the coming season.

Central Station Heating Notes.

DECATUR, ILL.—The State Utilities Commission has fixed the steam heat rates in Decatur at $1.67 for the first 1000 lbs. of condensation, and 56 cents for each additional 1000 lbs. The commission found that the consumer should not be required to pay for excess water passing through meters and requires the company to install on the service pipe, at the

HOWARD & MORSE

45 FULTON STREET, NEW YORK

VENTILATING ENGINEERS AND CONTRACTORS

MANUFACTURERS OF

Blackman

AND

Duplex Cone Fans

COMPLETE WITH

Motors, Duct Work and Wiring

Aligning, Rigging, Hoisting

GET OUR PRICES, PROFIT BY OUR EXPERIENCE OF LONG STANDING.

SEND FOR CATALOGUE.

points of entrance to the premises of those consumers who had abnormally high bills, a separator and a meter whereby the per cent of water carried in the steam may be determined. These instruments were to be set on or before Jan. 15, 1920, and a ratio of moisture to total water and steam delivered from Jan. 15, 1920 to May 15, 1920, will be applied to the 1918-19 heating season bills.

PEORIA, ILL.—The State public utilities commission has re-suspended to July 10 the proposed rates for steam heating in Peoria.

Manufacturers' Notes.

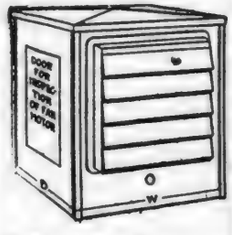
PRATT & CADY CO., INC., Hartford, Conn., announce the appointment of E. Coit Magens as director of sales; O. Lamson Beach as manager of the metropolitan store, 259 Canal St., New York; Quay T. Stewart as sales representative for Minneapolis, Minn.; and Henry J. Bride as sales representative for Hartford, Conn. The company has also opened branch stores in Philadelphia, at 529-531 Arch St., with H. H. Freund in charge; and in San Francisco, at 505 Mission St., with C. R. Mendelson in charge. In addition to its well-established lines of renewable disc globe valves, renewable seat gate valves, regrinding swing check valves and asbestos packed cocks, the company now also manufactures the Davis and Berryman line of feed-water heaters, hot water generators and power pumps, having purchased this business from I. B. Davis & Son, the original manufacturers. In addition Pratt & Cady Co. has further extended its line by the more recent purchase of a welded-steel tubing business and will continue manufacturing welded-steel tubing in the various diameters and gauges, and fabricating same into parts used by manufacturers of bicycles, motor-cycles, automobiles, vacuum cleaners, metal bedsteads, etc.

WESTINGHOUSE ELECTRIC INTERNATIONAL CO., which is affiliated with the Westinghouse Electric Mfg. Co.,

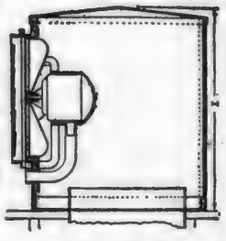
ILG POWER ROOF VENTILATORS

FOR

Buildings where Roof Ventilation Provides the only Practical Means of Exhausting Foul Air, Steam, Smoke, etc.



Ilg Power Roof Ventilator Showing Automatic Shutter



Sectional View Showing Placement of Fan

Fig 1. Showing localizing method of installing Ilg Power Roof Ventilator with vertical duct connected to hood over furnaces, mixing or cooking vats.

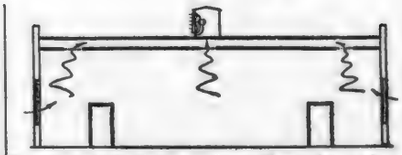


Fig 2. Lodge halls, theatres and upper floors of stores, factories, etc., are effectively ventilated by drawing air out through false space between ceiling and roof. Note registers in ceiling.

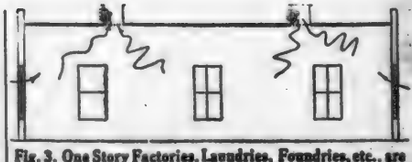


Fig. 3. One Story Factories, Laundries, Foundries, etc., are economically ventilated by locating Ilg Power Roof Ventilators directly over spots where ventilation is most needed. Fresh air thru windows gives complete circulation.

In sound practice, irrespective of atmospheric conditions, one ILG POWER ROOF VENTILATOR is equal to several ordinary natural gravity ventilators. Where the air to be handled is heavily ladened with steam, moisture, smoke, gases or fumes, the ILG POWER ROOF VENTILATOR is by far the most efficient. The only equipment of the kind with a "Fully enclosed self-cooled motor" driven fan.

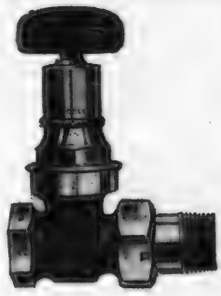
WRITE FOR CIRCULAR ILLUSTRATING THIS APPARATUS IN DETAIL

ILG ELECTRIC VENTILATING CO.

158 Whiting Street CHICAGO, ILL.

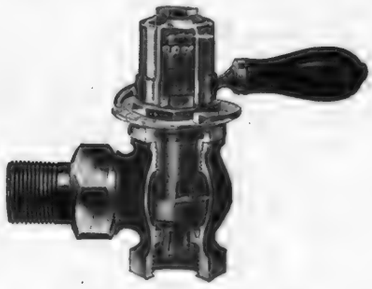
BRANCHES IN ALL LARGE CITIES

DOLE PACKLESS RADIATOR VALVES



Insure Satisfaction

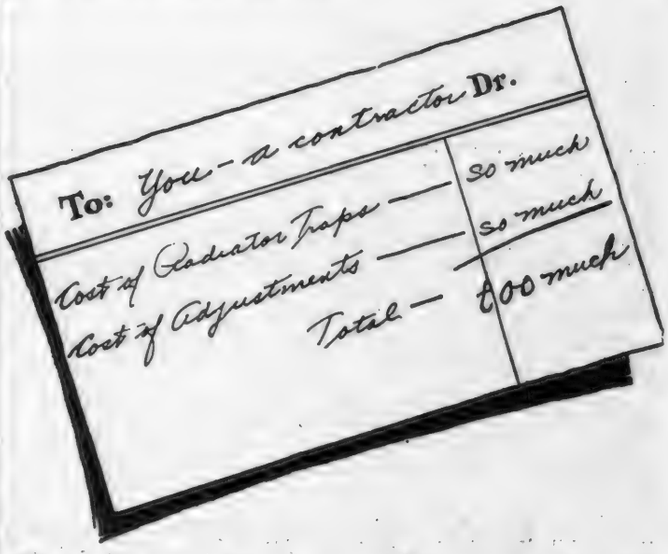
A Valve for Every System



Write for Catalogue and Discounts

The Dole Valve Company

208 North Fifth Ave. CHICAGO



Paying for a cheap trap

THE real price of some radiator traps doesn't appear on the bill, but you pay it just the same. For the cost of adjustments is just as correctly added to the account as the freight charge.

There's no charge for adjustments where the Johns-Manville Radiator Trap is used—because there's nothing to adjust. The total price you pay for a Johns-Manville Trap is a known quantity—and is never "too much".

How it works

It's a hollow copper ball that does the work. When there is no water to discharge, the ball is held against the discharge outlet. As water flows into the trap, the ball rolls up, exposing the outlet, and water is discharged. Any air that may be present is also drawn off. When the water level falls, the ball rolls down with it, preventing the loss of steam.

H. W. JOHNS-MANVILLE CO., New York City

10 Factories—Branches in 63 Large Cities

For Canada, Canadian Johns-Manville Co., Ltd., Toronto

Through—

Asbestos

and its allied products

JOHNS-MANVILLE
Serves in Conservation

Heat Insulations, High Temperature Cements, Asbestos Roofings, Packings, Brake Linings, Fire Prevention Products

JOHNS-MANVILLE Radiator Trap

Dependable Valves for Plumbing and Heating Service

WHERE Jenkins Valves go in—trouble never appears. They are constructed against "breakdowns." DEPENDABILITY is built into each valve. They are made to stand the severest conditions possible in the service for which they are recommended.

Jenkins Valves are made in types and sizes for every service.

Genuine Jenkins Valves are known by the Jenkins "Diamond Mark"

JENKINS BROS.

New York Philadelphia Chicago
Boston Montreal London

Jenkins Valves

2077-J

Pittsburgh, Pa., announces the appointment of I. F. Baker as its special representative in Tokio, Japan. Mr. Baker has been located in the company's New York office. He entered the Graduate Student Course in 1908, later serving in various capacities in the Resale and Contract Sections of the Sales Department. In 1913 he was transferred to the foreign department, which later became the Westinghouse Electric International Company.

H. W. JOHNS-MANVILLE Co., New York, announces the removal of its Des Moines office to more modern quarters at 213 Ninth Street. W. B. Roberts is manager. The new location will give the branch better facilities than ever for serving Iowa with the company's products, which include asbestos and magnesia, electrical, automotive equipment and allied goods.

OHIO BODY & BLOWER Co., Cleveland, O., is the title of a new corporation which has taken over the business of the Ohio Blower Company, manufacturer of the Swartwout Helico-centrifugal exhaust head and a line of steam specialties, including the Hydromatic steam trap. The Ohio Blower Company was organized 18 years ago, its first product being the Swartwout exhaust head. This cast-iron exhaust head was a pioneer of its kind. The sole other activity of the company was the manufacture and erection of dust-collecting systems. The latter department, during the following decade, was the wheel-horse of the company and remains to-day a considerable factor. The exhaust head proved to be the forerunner of a long line of kindred steam specialties, including steam and oil separators, the Hydromatic steam trap, water-level control valves, and feed-water heaters. In the meantime, the sheet-metal department brought out the Swartwout rotary ball-bearing ventilator, said to be the first successful device to apply the rotary principle to induce ventilation by means of a partial vacuum. Another development to the sheet-metal department was the addition of steel core-ovens, two styles being manufactured for the foundry trade.

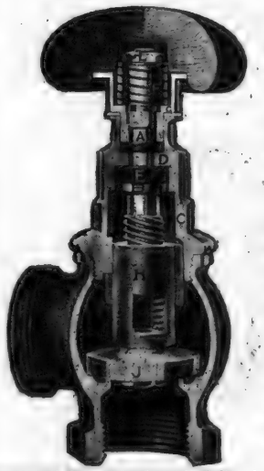
During the war period the company manufactured on a large scale the Swartwout standardized ship cowl, complete with turning gear, which was used in large quantities under the government program. This cowl, the first ever designed for quantity production, is now being developed for a peace-time market.

The new organization will enlarge the plant to provide space for a department for building high-grade motor bodies on a production basis. The Ohio Body & Blower Company takes over three plants from the older company which provide employment for 600 workers in 150,000 sq. ft. of floor space. By spring it is expected these figures will be increased to 1000 workers and 350,000 sq. ft. of floor space by the addition of another unit to Plant No. 2, on Detroit Avenue, Cleveland, to be devoted entirely to the building of closed automobile bodies. The paid-in capital of the new company is three times that of the Ohio Blower Company.

The change, it is stated, will not affect the personnel in any way. The principal officers are: President, D. K. Swartwout; and vice-president, H. H. Lind.

AMERICAN RADIATOR Co., Chicago, Ill., will build a warehouse and factory in Boston. The building will be two stories high, with 95,000 sq. ft. of floor space and will cost $1,500,000. The site for the new plant, covering more than 600,000 sq. ft. is on the water front in South Boston. It is planned to erect additional units which will give employment, eventually, to 3,000 persons. The company has declared a dividend of 3% and 4% extra on its common stock, and a dividend of 1¾% on its preferred stock. The directors have voted to submit to the stockholders a plan to reduce the par value of the common stock from $100 to $25, giving four shares of new stock for one old share. It is also proposed to issue about $1,500,000 additional stock of

Detroit Packless Radiator Valves



For steam or hot water heating in both gravity and vacuum systems.

They have a distinctly new packless construction which will be tight and will never leak around the stem.

The valves in all sizes are symmetrically proportioned, with a smooth satin finish on the metal surface, never before approached in radiator valve construction.

The highly finished mahogany handles are protected from damage by a cloth bag, which is not removed until after installation and completion of the decorating.

Handles are large, easy turning, without possibility of the hand coming in contact with hot metal.

DETROIT LUBRICATOR COMPANY
DETROIT. U. S. A.
Largest Manufacturers of Radiator Valves in the World

"ADVANCE" CONDENSATION PUMPS

For Low Pressure and Vapor Heating Systems

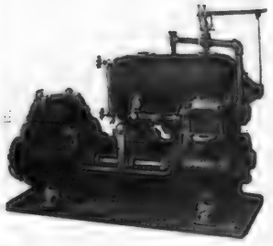
Electric Motor Driven
Automatic in Operation

Obtain absolute protection against overloading and burning out of motor by using "ADVANCE" Condensation Pump and Receiver Equipment.

Write now for Bulletin HV-205

Ten to thirty pounds pressure for 1,000 to 50,000 sq. ft. Electric current to suit. Large units special.

"Advance" Automatic Feed Pumps and Receivers



Fifteen to two hundred fifty pounds pressure for 1,000 to 60,000 sq. ft. Larger units special.

For the highest efficiency units
Write for Bulletin HV-218

Advance Pump and Compressor Co.
BATTLE CREEK, MICH.

"Sirocco"
TRADE MARK

Interior View of Sirocco Equipment of Buick Motor Co., Flint, Mich.

Conditioned Air in the Automotive Industry

Manufacturers of automobiles and automobile accessories are considered among the leaders in the application of heating and ventilating and air conditioning in their plants.

The installations they have made have been based upon careful study of the conditions as applied to the employe as well as the general manufacturer. They have found that in order to keep production up to the necessary standard, workers must be supplied with clear, pure air.

The view above illustrates "Sirocco" Air Conditioning equipment installed at the Buick Motor Car Company at Flint, Michigan. With this method the air is washed of all impurities and sent out into the factory heated to the proper degree for comfort in the winter and cooled to the right temperature during the summer months.

Air conditioning equipment is only a part of a number of heating and ventilating products bearing the "Sirocco" mark. If you have a problem that involves ventilating or air conditioning especially, we would like to have you get in touch with us.

AMERICAN BLOWER COMPANY, Detroit, Michigan

Branches in all large cities

Canadian Sirocco Company, Ltd.
Windsor, Ont.

$25.00 par value, which will be sold to both preferred and common stockholders at $62.50 a share to the extra extent of 10% of their holdings.

CLARAGE FAN CO., Kalamazoo, Mich., will double the capacity of its foundry by building two additions, one 28 x 170 ft. and one 66 x 70 ft. A new machine shop will also be built and the addition of another cupola to the company's foundry is being planned. The improvements will cost about $100,000.

PIERCE, BUTLER & PIERCE MFG. CORPORATION, New York, announces that the fire at its plant in Eastwood, near Syracuse, N. Y., was not as serious as first reported. The fire, it is stated, was confined to the boiler room and machine shops and to the gauge and valve division. The damage is being rapidly repaired and there has been no interruption in shipping.

UNITED STATES RADIATOR CORPORATION, Detroit, Mich., has declared a dividend of 7% on its preferred stock.

HUDSON BOILER MFG. CO., NEW YORK, has appointed Franklin Lane as general manager of sales. Mr. Lane is the secretary of the company and was formerly manager of sales in the Hudson River territory. He succeeds Israel Jacobs, who has retired from the company.

CHICAGO, ILL.—The use of a tower to add beauty and dignity to industrial plants is being featured in Chicago, and among the typical structures cited of this sort is the new plant of the Ilg. Electric Ventilating Company. Commenting on this building, the *Chicago Tribune* says:

The building of the Ilg. Electric Ventilating company, being two stories, lends itself to architectural beautification. But even in this instance, the high tower at one end adds much to the dignity of the plant. The entire building and tower will be of reinforced concrete. The structure has an area of about 94,000 sq. ft. and is the first unit covering one-fourth of the property. The cost of this unit will be $300,000.

GREENFIELD TAP AND DIE CORPORATION, Greenfield, Mass., announces that Frank O. Wells, president of the corporation, and one of the most prominent figures in the screw thread industry in this country, has sold his entire holdings to Frederick H. Payne, vice-president. Mr. Wells retires as president and member of the board of directors and Mr. Payne has been elected president in his place. F. G. Echols, vice-president and general manager, has been elected a director of the corporation. Mr. Wells, it is stated, will remain with the corporation in an advisory capacity.

AMERICAN BLOWER CO., Detroit, Mich., has appointed Thomas Chester and E. C. Evans as joint managers of the company's Pittsburgh office, which is located in the Empire Building, Pittsburgh. Mr. Evans has been with the company 15 years and Chester was chief engineer of the company for six years and has recently been in charge of the St. Louis office.

New Firms and Business Changes

GRINNELL COMPANY, Providence, R. I., has been formed to take over all of the sales and contracting business which was formerly carried on by the Grinnell Fire Extinguisher Company. This change is made, it is stated, because the old name so specifically described the automatic fire protection section of the company's business that it prevented any natural assumption on the part of the public that the company was engaged in several closely-related lines of business. The company's business, it is added, is based fundamentally on industrial piping, being one of the largest concerns in the country doing exclusively that sort of work. The related industries which the Grinnell Company takes over consist of fire protection, power and process piping, steam, water and gas heating; drying; and sales of pipe, fittings, valves and supplies. The basis of the original company, which was founded in 1850, was not fire protection, but steam and gas piping. In the early 70's a special line of work developed through the adoption of perforated

Engineers and contractors will find our new publication describing Bicalky fans and air washers of interest. Write today for your copy; no obligation attached.

Hersh & Brother, Allentown, Pa.

Buffalo Equipped

THE prominent buildings in all parts of the country are equipped with

Buffalo Heating and Ventilating Apparatus

It puts heat, mechanically, just where it is wanted, keeps it in circulation and prevents it from escaping through the ventilators in in the roof until it has been used to the best advantage. Saves coal—increases efficiency of workers.

Catalog No. 198-36 gives valuable engineering data on heating and ventilating problems and our engineering department is always available for consultation.

Buffalo Forge Company
Buffalo, N. Y.
Offices in all Principal Cities

"Buffalo"

pipe systems for fire protection. This crude form of protection was soon supplanted by automatic sprinklers in the manufacture and installation of which the company was a pioneer. It is not generally known that the company is the oldest heating firm in America and is prepared to design and install steam or water heating systems complete for industrial plants. Within recent years the company has taken over the Rector system of gas heating and has now developed a type of gas radiator which can be used without exhaust piping or with the exhaust feature so that the products of combustion are discharged outdoors. In addition, the Grinnell Company has recently completed arrangements closely identifying it with the Gordon Dryer Corporation so that it will now enter this field on a large scale.

HARDING AND CREA, Buffalo, N. Y., is the title of a new heating engineering and contracting firm, composed of L. A. Harding and T. C. Crea. Mr. Harding is widely-known to the heating profession as co-author of the monumental work on "Mechanical Equipment of Buildings," of which Vol. 1 on "Heating and Ventilation" and Vol. 2 on "Power Plants and Refrigeration" have been published. The new firm has opened offices in the White Building, Buffalo.

JOHN G. LOOS PLUMBING & HEATING Co., STERLING, ILL., has dissolved its business.

New Incorporations.

W. P. KIEFABER Co., Dayton, O., capital $200,000, to deal in heating and plumbing supplies. W. P. Kiefaber is president and manager, and F. R. De Weese, secretary. Both have been connected with the Gibbons Supply Company, for a number of years. The new firm has occupied the plant of the Dayton Fan and Motor Company.

RICHARDS MFG. Co., Grand Rapids, Mich., capital $100,000, to conduct wholesale and jobbing business in heating and plumbing supplies. President, G. A. Richards; Secretary-treasurer, F. J. Slooter. The company takes over the business of the Richards Plumbing and Heating Company, and of the manufacturing company, retaining the name of the latter. The offices of the company are at the Scribner Avenue plant. Mr. Richards came to Grand Rapids 30 years ago and first entered the employ of Foster & Stevens where he learned the tinsmith trade. Afterwards he was with Weatherly & Pulte. He entered business for himself in 1889, the firm name being Barnett & Richards. Afterwards the firm became Richards, Kuennen & Co. Later he organized the Richards Plumbing & Heating Co. and the Richards-Wilson Pipe Covering Co., originators of the Ric-Wil underground pipe conduit. This company afterwards became the Richards Mfg. Co.

MECHANICAL MEMORY SYSTEMS, Aurora, Ill., has been incorporated to manufacture a visible control system for furnishing a mechanical memory to the executive's desk. The system provides a visible schedule of pending work at all times.

Housing Notes.

In connection with the present housing crisis in the United States, the directors of the American Institute of Architects have sent a letter to the President's Industrial Conference, stating that "the question of living conditions, is seriously engaging the peoples of every civilized nation."

"No solution of our industrial unrest" continues the letter "can be possible until the primary requisite of shelter is acknowledged as a crucial factor. In principle, it may perhaps be said, without fear of contradiction, that we are faced with a shortage in dweling-places of formidable proportions. Likewise it may be said that no satisfactory plans for meeting this shortage have as yet been advanced.

"No figures are at present available to indicate the measure of the

The Fellow Who Says,
"What You Don't Know Won't Hurt You,"
may be Right in a Dairy Lunch,
but He's all Wrong in Business.

Isn't He?

Then, so that you may know the story of Manufactured Weather in Modern Industry, write to me today and ask me to send you a copy of my new book "Weather." It's gratis, of course, and I'm right proud of the way in which my thousands of friends have received it. They say it tells 'em the real dope without a lot of technical camouflage.

Why don't you ***write right now?***

Carrier Engineering Corporation

Specialists in Manufactured Weather

39 Cortlandt Street NEW YORK CITY

Offices at
Boston Buffalo
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Yours to make

"Every day a good day"

The Mechanical Weather Man

Meeting Theater Needs with Massachusetts Fans

In theatre buildings the ventilation problem is to secure adequate ventilation—*quietly*.

Massachusetts Fans effectively meet the rigid requirements of theatre ventilation regardless of the size of the building, with a saving in space and weight combined with rugged construction and quiet, economical operation.

A long list of buildings heated and ventilated by Massachusetts apparatus is indicative of the manner in which it has been the solution of many ventilation problems.

The services of our Engineering Department are at the disposal of any architect or builder whose plans include the installation or remodelling of a ventilation system.

MASSACHUSETTS BLOWER COMPANY
Watertown, Mass.

New York **Boston** **Chicago**

Branches in 20 principal cities throughout the country

100-13

MASSACHUSETTS FANS

need for new dwellings. In New York City alone it has been computed by careful survey that no less than 30,000 new dwelling-places are needed to care for the present shortage. Almost without exception, every great city reflects a like condition.

"The causes for this condition are no doubt many and various. They relate to the war, to the cost of building, to wages, rents, land and building speculation, and, incidentally, to the whole fabric of our industrial system."

It is announced from Charleston, W. Va., that housing conditions in and around that city have become so acute that a corporation, with a capital of $500,000 has been formed by the Chamber of Commerce of Charleston and St. Albans to provide homes for 1500 additional Federal employees.

It is also announced, under date of January 8, that the housing commission of Winnipeg, Man., operating under the city's housing plan, will make a loan of 85% on the net cost of a home. A first mortgage will be taken on the property for 20 years, repayable at the rate of $7.13 a month for each $1,000 borrowed.

Chamber of Commerce of the United States on the Business Outlook.

Sustained industrial activity is the prediction of the Committee on Statistics of the Chamber of Commerce of the United States, which has recently issued its regular end-of-the-year review of business and crop conditions. The committee emphasizes the hopefulness of the manufacturing industry generally, which, although encountering constant labor troubles and shortage of fuel and materials, has orders in excess of its capacity for production within any reasonable time.

Great activity in building is reported in sections except where crop failures were extensive, while soft coal mining is in poor shape in contrast to the mining of hard coal; and oil production is good.

STATE LAWS AND MUNICIPAL REGULATIONS
require that all public buildings be uniformly heated

Cleveland Electric Thermometers

accurately indicate or record the temperatures of the various rooms, outside atmosphere, etc., at a central point in the boiler room, custodian's office or wherever desired. The use of a CLEVELAND PYROMETER installation in addition to adding to the comfort of the occupants will aid the engineer or fireman in reducing the fuel bills.

THE CLEVELAND INSTRUMENT CO.
Electrical Measuring and Recording Instruments
CLEVELAND, OHIO

New York Repres.
Herman H. Sticht & Co.

Buffala Office
43 South Division St.

AN ORGANIZATION

handling engineering sales in the Philadelphia District desires to take on additional lines of high-class manufacturers for exclusive representation.

All replies will be kept in strict confidence.

Address all replies to

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Drying
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Ventilation
Air Washers
Mechanical Draft

Let us make your plans and estimates

Get Catalogues 65-B and 67-B

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WORKS:
Bucyrus, Ohio

GOOD JUDGMENT

Your judgment in deciding upon heating and ventilating apparatus has come from experience. Experience has convinced you that quality and efficiency are vital. You consider the experience which has contributed to the apparatus and system you contemplate purchasing. You have faith in an organization with a reputation established by sincerity of purpose and excellence of product. That is why you naturally look to Sturtevant when you have a problem in heating and ventilation.

The Engineering personnel of the Sturtevant organization is very definitely established. Air problems of every description are answerable within this organization. The apparatus—fans, heaters, air washers, motors, engines, turbines—is built on the lines of the best air engineering practice founded upon 60 years of progressive manufacturing experience.

Because this apparatus is so manufactured you are assured of a system with high efficiency, low operating cost, and continuous good service.

Consultation is welcome. Our literature is sent on request.

Whatever your problem is
write us

B. F. STURTEVANT COMPANY
HYDE PARK, BOSTON, MASSACHUSETTS
AND ALL PRINCIPAL CITIES

Philadelphia Chamber of Commerce Sounds Call for Pure Americanism.

Demanding that the government continue its warfare against radicals throughout the country, the board of directors of the Philadelphia Chamber of Commerce, at its November meeting, approved unanimously a strong statement endorsing the action of the Department of Justice, sustaining and approving the announced intention to deport all aliens who have been preaching and practicing doctrines at variance with true Americanism and reaffirming its belief in America for Americans only. The resolution formally adopted by the board was sent to the attorney-general of the United States. The text of the resolution, which has been hailed as a masterpiece of its kind, is as follows:

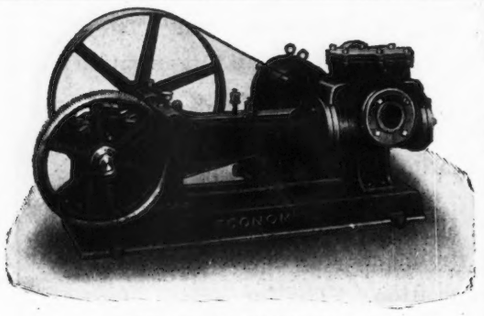
WHEREAS, A spirit of unrest is prevalent throughout this country at the present time and is manifesting itself not only by lawless actions, but also by means of insidious propaganda tending to undermine the foundations of justice, the security of the law and the sanctity of the home, and

WHEREAS, We believe this condition of the public mind has been and is being encouraged and stimulated by the malignant and premeditated efforts of a small group of radicals who have been sent to this country with explicit and definite instructions to foment disorder and dissatisfaction, sabotage and syndicalism, and

WHEREAS, It is evident that there is in progress a carefully-planned campaign having for its purpose the weakening of our National Government, and

WHEREAS, We believe that not until direct and definite action is taken to stamp out each and every false ideal nurtured by this radical element will there be found the remedy which we need

NOW, THEREFORE, BE IT RESOLVED, That we, the Directors of the Philadelphia Chamber of Commerce, speaking directly for seven thousand leaders in the commercial and indus-



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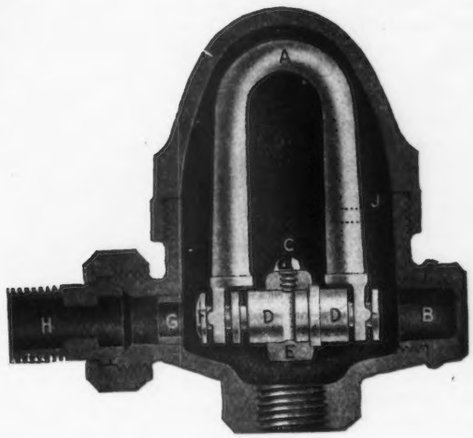

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trial life of this city and indirectly for the two million inhabitants of this, the birthplace of Liberty and Independence, as well as for true Americans everywhere, do condemn each one and all of those manifestations whereby the radical element in the population of this country—whether known by the name of Socialists, Industrial Workers of the World, Anarchists, Bolsheviki, or any other term—have been and are endeavoring to bring about social, political, and economic revolution and we do denounce as inhuman and un-American the attempts that are being made to foster and spread such sentiments, and

BE IT RESOLVED, FURTHER, That we endorse the action taken by the United States Department of Justice in its campaign for the suppression of this evil by the arrest of those foreign-born and unnaturalized leaders, as well as those American-born, who have been preaching and practising the doctrines of anarchy and that we demand an unceasing continuance of this rigorous action by the Government and that we sustain and approve of the announced intention of the Government to deport these and All others of their ilk without delay and that we express our belief that this course of action, tardy though it might well be termed, cannot fail to have the desired result in ridding the United States of America once and for all time of those undesirable aliens who have abused the hospitality and misrepresented and misconstrued the ideals of Americanism, and

BE IT RESOLVED FURTHER, That we reaffirm our fixed and unalterable belief in the policy of Americanization for all aliens and in the education of foreign-born residents in the language, customs and ideals of Americanism and that we do urge insistently upon the President and Congress of the United States that the immigration laws of this country be so amended and enforced as to provide a consistent safeguard against the entrance into the United States of that radical element, the presence of which we believe has brought about the present condition of unrest.

WANTED

Wanted—Ambitious young man of 22 desires position with central station steam heating company in central State. Has five years' practical experience. At present has position as heating superintendent, but has excellent reasons for desiring a change. Address Marshall L. Williams, care Natrona Power Co., Casper, Wyo.

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Wanted.—An A1 estimator on heating and ventilating work. Permanent position to right party. Apply in own handwriting to Box 353, Greensboro, N. C.

Business Opportunity.—Experienced man in the heating and ventilating business desires to make connection with a party or corporation that will manufacture and exploit a ventilating specialty that has the approval of heating engineers and is installed in various buildings throughout the country. Protected by U. S. Patents. Address Specialty, care of HEATING AND VENTILATING MAGAZINE.

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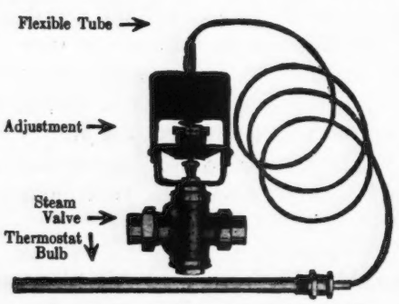

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